SCIENCE

FRIDAY, DECEMBER 30, 1932

The American Association for the Advancement of	
Science:	
The Aims of Anthropological Research: Dr. Franz	
Boas	605
Conquest of the Physical World: Professor Ber- GEN DAVIS	613
Obituary:	
William Sydney Thayer: Dr. LEWELLYS F. BARKER	617
Scientific Events:	
Scientific Work under the Government; The New Refracting Telescope of the Franklin Institute; The Award of Medals of the Royal Society to Dr. Hale and Professor Haber; Award of the	
Philip A. Conné Medal to Professor Abel	619
cientific Notes and News	621
Discussion:	
Dissemination of Scientific Knowledge: Dr. Einar Leifson. Viability of Drosophila Spermatozoa in Sea Water: Professor Ruth B. Howland. River Deflection: Dr. Herman L. Fairchild	624
nuotations:	

1989

alka.

agimeVOL. 76

Congress and Research

Constant Temperature Apparatus Adapted for
Use on the Microscope Stage: ROBERT F. PITTS.
Peat Mats for Germination Tests of Forest Tree
Seeds: PHILIP C. WAKELEY
Special Articles:
Apparent Parthenogenesis in Nature in a Form of
Fish of Hybrid Origin: Dr. CARL L. HUBBS and
LAURA C. HUBBS. The Vitamin C Activity of
Hexuronic Acid from Suprarenal Glands: W. A.
WAUGH and Professor C. G. King628
Science News

No. 1983

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. McKeen Cattell and published every Friday by

THE SCIENCE PRESS

New York City: Grand Central Terminal Lancaster, Pa. Garrison, N. Y. Annual Subscription, \$6.00 Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary, in the Smithsonian Institution Building, Washington, D. C.

THE AIMS OF ANTHROPOLOGICAL RESEARCH¹

By Dr. FRANZ BOAS

COLUMBIA UNIVERSITY

THE science of anthropology has grown up from many distinct beginnings. At an early time men were interested in foreign countries and in the lives of their inhabitants. Herodotus reported to the Greeks what he had seen in many lands. Caesar and Tacitus wrote on the customs of the Gauls and Germans. In the Middle Ages Marco Polo, the Venetian, and Ibn Batuta, the Arab, told of the strange people of the Far East and of Africa. Later on, Cook's Journeys excited the interest of the world. From these reports arose gradually a desire to find a general significance in the multifarious ways of living of strange people. In the eighteenth century Rousseau, Schiller and Herder tried to form, out of the reports of travelers, a picture of the history of mankind. More solid attempts were made about the middle of the nineteenth

¹ Address of the president of the American Association for the Advancement of Science, Atlantic City, December, 1932.

century, when the comprehensive works of Klemm and Waitz were written.

Biologists directed their studies towards an understanding of the varieties of human forms. Linnaeus, Blumenbach, Camper are a few of the names that stand out as early investigators of these problems, which received an entirely new stimulus when Darwin's views of the instability of species were accepted by the scientific world. The problem of man's origin and his place in the animal kingdom became the prime subject of interest. Darwin, Huxley and Haeckel are outstanding names representing this period. Still more recently the intensive study of heredity and mutation has given a new aspect to inquiries into the origin and meaning of race.

The development of psychology led to new problems presented by the diversity of the racial and social groups of mankind. The question of mental characteristics of races, which at an earlier period had become a subject of discussion with entirely inadequate methods—largely stimulated by the desire to justify slavery—was taken up again with the more refined technique of experimental psychology, and particular attention is now being paid to the mental status of primitive man and of mental life under pathological conditions. The methods of comparative psychology are not confined to man alone, and much light may be thrown on human behavior by the study of animals. The attempt is being made to develop a genetic psychology.

Finally sociology, economics, political science, history and philosophy have found it worth while to study conditions found among alien people in order to throw light upon our modern social processes.

With this bewildering variety of approaches, all dealing with racial and cultural forms, it seems necessary to formulate clearly what the objects are that we try to attain by the study of mankind.

We may perhaps best define our objective as the attempt to understand the steps by which man has come to be what he is, biologically, psychologically and culturally. Thus it appears at once that our material must necessarily be historical material, historical in the widest sense of the term. It must include the history of the development of the bodily form of man, his physiological functions, mind and culture. We need a knowledge of the chronological succession of forms and an insight into the conditions under which changes occur. Without such data progress seems impossible and the fundamental question arises as to how such data can be obtained.

Ever since Lamarck's and Darwin's time the biologist has been struggling with this problem. The complete paleontological record of the development of plant and animal forms is not available. Even in favorable cases gaps remain that can not be filled on account of the lack of intermediate forms. For this reason indirect proofs must be resorted to. These are based partly on similarities revealed by morphology and interpreted as proof of genetic relationship, partly on morphological traits observed in prenatal life, which suggest relationship between forms that as adults appear quite distinct.

Caution in the use of morphological similarities is required, because there are cases in which similar forms develop in genetically unrelated groups, as in the marsupials of Australia, which show remarkable parallelism with higher mammal forms, or in the white-haired forms of the Arctic and of high altitudes, which occur independently in many genera and species, or in the blondness and other abnormal hair forms of domesticated mammals which develop regardless of their genetic relations.

As long as the paleontological record is incomplete we have no way of reconstructing the history of animals and plants except through morphology and embryology.

This is equally true of man, and for this reason the eager search for early human and prehuman forms is justified. The finds of the remains of the Pithecanthropus in Java, the Sinanthropus in China, of the Heidelberg jaw and of the later types of the glacial period are so many steps advancing our knowledge. It requires the labors of the enthusiastic explorer to furnish us with the material that must be interpreted by careful morphological study. The material available at the present time is sadly fragmentary. It is encouraging to see that it is richest in all those countries in which the interest in the paleontology of man has been keenest, so that we may hope that with the increase of interest in new fields the material on which to build the evolutionary history of man will be considerably increased.

It is natural that with our more extended knowledge of the evolutionary history of the higher mammals certain points stand out that will direct the labors of the explorer. Thus on the basis of our knowledge of the distribution of ape forms, nobody would search for the ancestors of humanity in the New World, although the question when the earliest migration of man into America took place is still one of the problems that is prominent in researches on the paleontology of the glacial period of America.

The skeletal material of later periods is more abundant. Still it is difficult to establish definitely the relation of early skeletal remains and of modern races, because many of their most characteristic traits are found in the soft parts of the body that have not been preserved. Furthermore, the transitions from one race to another are so gradual that only extreme forms can be determined with any degree of definiteness.

On account of the absence of material elucidating the history of modern races, it is not surprising that for many years anthropologists have endeavored to classify races, basing their attempts on a variety of traits, and that only too often the results of these classifications have been assumed as expressions of genetic relationship, while actually they have no more than a descriptive value, unless their genetic significance can be established. If the same metric proportions of the head recur in all races they can not be a significant criterion of fundamental racial types, although they may be valuable indications of the development of local strains within a racial group. If, on the other hand, a particular hair form is a trait well-nigh universal in extensive groups of mankind, and one that does not recur in other groups, it

ete

of

nd

on

an

he

he

1-

X-

le

will in all probability represent an ancient hereditary racial trait, the more so, if it occurs in a geographically continuous area. It is the task of the anthropologist to search out these outstanding traits and to remember that the exact measurement of features which are not exclusive racial characteristics will not answer the problems of the evolution of fundamental types, but can be taken only as an indication of independent, special modifications of late origin within the large racial groups.

From this point of view the general question of the occurrence of parallel development in genetically unrelated lines assumes particular importance. We have sufficient evidence to show that morphological form is subject to environmental influences that in some cases will have similar effects upon unrelated forms. Even the most skeptical would admit this for size of the body.

Changes due to environment that occur under our eyes, such as minute changes in size and proportion of the body, are probably not hereditary, but merely expressions of the reaction of the body to external conditions and subject to new adjustments under new conditions.

However, one series of changes, brought about by external conditions, are undoubtedly hereditary. I mean those developing in domestication. No matter whether they are due to survival of aberrant forms or directly conditioned by domestication, they are found in similar ways in all domesticated animals, and because man possesses all these characteristics he proves to be a domesticated form. Eduard Hahn was probably the first to point out that man lives like a domesticated animal; the morphological points were emphasized by Eugen Fischer, B. Klatt and myself.

The solution of the problem of the origin of races must rest not only on classificatory studies and on those of the development of parallel forms, but also on the consideration of the distribution of races, of early migrations and consequent intermingling or isolation.

On account of the occurrence of independent development of parallel forms it seems important to know the range of variant local forms that originate in each race, and it might seem plausible that races producing local variants of similar types are closely related. Thus Mongolids and Europeans occasionally produce similar forms in regions so wide apart that it would be difficult to interpret them as effects of intermingling.

The biological foundations of conclusions based on this type of evidence are, to a great extent, necessarily speculative. Scientific proof would require a knowledge of the earliest movements of mankind, an intimate acquaintance with the conditions under which racial types may throw off variants and the character and extent of such variations.

The solution of these problems must extend beyond morphological description of the race as a whole. Since we are dealing to a great extent with forms determined by heredity, it seems indispensable to found the study of the race as a whole on that of the component genetic lines and of their variants, and on inquiries into the influence of environment and selection upon bodily form and function. The race must be studied not as a whole but in its genotypical lines as developing under varying conditions.

In the study of racial forms we are too much inclined to consider the importance of races according to the number of their representatives. This is obviously an error, for the important phenomenon is the occurrence of stable morphological types, not the number of individuals representing each. The numerical strength of races has changed enormously in historic times, and it would be quite erroneous to attribute an undue importance to the White race or to the East Asiatics, merely because they have outgrown in numbers all other racial types. Still, in descriptive classifications the local types of a large race are given undue prominence over the less striking subdivisions of lesser groups. As an example, I might mention Huxley's divisions of the White race as against his divisions of other races.

We are interested not only in the bodily form of races but equally in the functioning of the body, physiologically as well as mentally. The problems presented by this class of phenomena present particular difficulties on account of the adjustability of function to external demands, so that it is an exceedingly precarious task to distinguish between what is determined by the biological make-up of the body and what depends upon external conditions. Observations made on masses of individuals in different localities may be explained equally well by the assumption of hereditary racial characteristics and by that of changes due to environmental influences. A mere description of these phenomena will never lead to a result. Different types, areas, social strata and cultures prove to exhibit differences in physiological and mental function. A dogmatic assertion that racial type alone is responsible for these differences is a pseudo science. An adequate treatment requires a weighing of the diverse factors.

Investigators are easily misled by the fact that the hereditary, biologically determined endowment of an individual is intimately associated with the functioning of his body. This appears most clearly in cases of bodily deficiency or of unusually favorable bodily development. It is quite a different matter to extend this observation over whole populations or racial

groups in which are represented a great variety of hereditary lines and individuals, for the many forms of bodily make-up found in each group allows a great variety of functioning. Hereditary characteristics are pronounced in genetic lines, but a population—or to use the technical term, a phenotype—is not a genetic line and the great variety of genotypes within a race forbids the application of results obtained from a single hereditary line to a whole population in which the diversity of the constituent lines is bound to equalize the distribution of diverse genetic types in the populations considered. I have spoken so often on this subject that you will permit me to pass on to other questions.

While paleontological evidence may give us a clue to the evolution of human forms, only the most superficial evidence can be obtained for the development of function. A little may be inferred from size and form of the brain cavity and that of the jaw, in so far as it indicates the possibility of articulate speech. We may obtain some information on the development of erect posture, but the physiological processes that occurred in past generations are not accessible to observation. All the conclusions that we may arrive at are based on very indirect evidence.

The mental life of man also can be studied experimentally only among living races. It is, however, possible to infer some of its aspects by what past generations have done. Historical data permit us to study the culture of past times, in a few localities, as in the eastern Mediterranean area, India, China as far back as a few thousand years—and a limited amount of information on the mental life of man may be obtained from these data. We may even go farther back and extend our studies over the early remains of human activities. Objects of varied character, made by man and belonging to periods as early as the Quaternary, have been found in great quantities, and their study reveals at least certain aspects of what man has been able to do during these times.

The data of prehistoric archeology reveal with progress of time a decided branching out of human activities. While from earliest periods nothing remains but a few simple stone implements, we see an increasing differentiation of form of implements used by man. During the Quaternary the use of fire had been discovered, artistic work of high esthetic value had been achieved, and painted records of human activities had been made. Soon after the beginning of the recent geological period the beginnings of agriculture appear and the products of human labor take on new forms at a rapidly accelerating rate. While in early Quaternary times we do not observe any change for thousands of years, so that the observer might imagine that the products of human hands

were made according to an innate instinct, like the cells of a beehive, the rapidity of change becomes the greater the nearer we approach our time, and at an early period we recognize that the arts of man can not be instinctively determined, but are the cumulative result of experience.

It has often been claimed that the very primitiveness of human handiwork of early times proves organic mental inferiority. This argument is certainly not tenable, for we find in modern times isolated tribes living in a way that may very well be paralleled with early conditions. A comparison of the psychic life of these groups does not justify the belief that their industrial backwardness is due to a difference in the types of organism, for we find numbers of closely related races on the most diverse levels of cultural status. This is perhaps clearest in the Mongolid race, where by the side of the civilized Chinese are found the most primitive Siberian tribes, or in the American group, where the highly developed Maya of Yucatan and the Aztecs of Mexico may be compared with the primitive tribes of our western plateaus. Evidently historic and prehistoric data give us little or no information on the biological development of the human mind.

How little the biological, organic determinants of culture can be inferred from the state of culture appears clearly if we try to realize how different the judgment of racial ability would have been at various periods of history. When Egypt flourished, northern Europe was in primitive conditions, comparable to those of American Indians or African Negroes, and yet northern Europe of our day has far outdistanced those people, who at an earlier time were the leaders of mankind. An attempt to find biological reasons for these changes would necessitate innumerable unprovable hypotheses regarding changes of the biological make-up of these peoples, hypotheses that could be invented only for the purpose of sustaining an unproved assumption.

A safer mode of approaching the problems at issue would seem to lie in the application of experimental psychology which might enable us to determine the psychophysical and also some of the mental characteristics of various races. As in the case of biological inquiry it would be equally necessary in this study to examine genotypical lines rather than populations, because so many different lines are contained in the mass.

A serious difficulty is presented by the dependence of the results of any psychophysical or mental tests upon the experiences of the individual who is the subject of the tests. His experiences are largely determined by the culture in which he lives. I am of the opinion that no method can be devised by

the

omes

id at

man

the

tive-

oves

cer-

ated

eled

chie

that

ence

of

of

the

zed

bes,

ped

be

ern

ive

p-

of

p-

he

us

rn

to

ıd

ed

rs

ıs

which this all-important element is eliminated, but that we always obtain a result which is a mixed impression of culturally determined influences and of bodily build. For this reason I quite agree with those critical psychologists who acknowledge that for most mental phenomena we know only European psychology and no other.

In the few cases in which the influence of culture upon mental reaction of populations has been investigated it can be shown that culture is a much more important determinant than bodily build. I repeat, that in individuals a somewhat close relation between mental reaction and bodily build may be found, which is all but absent in populations. Under these circumstances it is necessary to base the investigation of the mental life of man upon a study of the origin and history of cultural forms and of the interrelations between individual mental life and culture.

This is the subject-matter of cultural anthropology. It is safe to say that the results of the extensive materials amassed during the last fifty years do not justify the assumption of any close relation between biological types and form of culture.

As in the realm of biology our inferences must be based on historical data, so it is in the investigation of cultures. Unless we know how the culture of each group of man came to be what it is, we can not expect to reach any conclusions in regard to the conditions controlling the general history of culture.

The material needed for the reconstruction of the biological history of mankind is insufficient on account of the paucity of remains and the disappearance of all soft, perishable parts. The material for the reconstruction of culture is ever so much more fragmentary because the largest and most important asspects of culture leave no trace in the soil; language, social organization, religion-in short, everything that is not material—vanishes with the life of each generation. Historical information is available only for the most recent phases of cultural life and is confined to those peoples who had the art of writing and whose records we can read. Even this information is insufficient because many aspects of culture find no expression in literature. Is it then necessary to resign ourselves and to consider the problem as insoluble?

In biology we supplement the fragmentary paleontological record with data obtained from comparative anatomy and embryology. Perhaps an analogous procedure may enable us to unravel some of the threads of cultural history.

There is one fundamental difference between biological and cultural data which makes it impossible to transfer the methods of the one science to the other. Animal forms develop in divergent directions, and an intermingling of species that have once become distinct is negligible in the whole developmental history. It is otherwise in the domain of culture. Human thoughts, institutions, activities may spread from one social unit to another. As soon as two groups come into close contact their cultural traits will be disseminated from the one to the other.

Undoubtedly there are dynamic conditions that mould in similar forms certain aspects of the morphology of social units. Still we may expect that these will be overlaid by extraneous elements that have no organic relation to the dynamics of inner change.

This makes the reconstruction of cultural history easier than that of biological history, but it puts the most serious obstacles in the way of discovering the inner dynamic conditions of change. Before morphological comparison can be attempted the extraneous elements due to cultural diffusion must be eliminated.

When certain traits are diffused over a limited area and absent outside of it, it seems safe to assume that their distribution is due to diffusion. In some rare cases even the direction of diffusion may be determined. If Indian corn is derived from a Mexican wild form and is cultivated over the larger part of the two Americas we must conclude that its cultivation spread from Mexico north and south; if the ancestors of African cattle are not found in Africa, they must have been introduced into that continent. In the majority of cases it is impossible to determine with certainty the direction of diffusion. It would be an error to assume that a cultural trait had its original home in the area in which it is now most strongly developed. Christianity did not originate in Europe or America. The manufacture of iron did not originate in America or northern Europe. It was the same in early times. We may be certain that the use of milk did not originate in Africa, nor the cultivation of wheat in Europe.

For these reasons it is well-nigh impossible to base a chronology of the development of specific cultures on the observed phenomena of diffusion. In a few cases it seems justifiable to infer from the world-wide diffusion of a particular cultural achievement its great antiquity. This is true when we can prove by archeological evidence its early occurrence. Thus, fire was used by man in early Quaternary times. At that period man was already widely scattered over the world and we may infer that either the use of fire was carried along by him when he migrated to new regions or that it spread rapidly from tribe to tribe and soon became the property of mankind. This method can not be generalized, for we know of other inventions or ideas that spread with incredible rapidity

an

ine

a 1

wh

wh

ter

ter

pe

fer

of

we

up

of

me

ar

80

og

ir

pi

over vast areas. An example is the spread of tobacco over Africa, as soon as it was introduced on the coast.

In smaller areas attempts at chronological reconstruction are much more uncertain. From a cultural center in which complex forms have developed, elements may radiate and impress themselves upon neighboring tribes, or the more complex forms may develop on an old less differentiated basis. It is seldom possible to decide which one of these alternatives offers the correct interpretation.

Notwithstanding all these difficulties, the study of geographical distribution of cultural phenomena offers a means of determining their diffusion. The outstanding result of these studies has been the proof of the intricate interrelation of people of all parts of the world. Africa, Europe and the greater part of Asia appear to us as a cultural unit in which one area can not be entirely separated from the rest. America appears as another unit, but even the New World and the Old are not entirely independent of each other, for lines of contact have been discovered that connect northeastern Asia and America.

As in biological investigations the problem of parallel independent development of homologous forms obscures that of genetic relationship, so it is in cultural inquiry. If it is possible that analogous anatomical forms develop independently in genetically distinct lines, it is ever so much more probable that analogous cultural forms develop independently. It may be admitted that it is exceedingly difficult to give absolutely indisputable proof of the independent origin of analogous cultural data. Nevertheless, the distribution of isolated customs in regions far apart hardly admits of the argument that they were transmitted from tribe to tribe and lost in intervening territory. It is well known that in our civilization current scientific ideas give rise to independent and synchronous inventions. In an analogous way primitive social life contains elements that lead to somewhat similar forms in many parts of the world. Thus the dependence of the infant upon the mother necessitates at least a temporary difference in the mode of life of the sexes and makes woman less movable than man. The long dependence of children on their elders leaves also an inevitable impress upon social form. Just what these effects will be depends upon circumstances. Their fundamental cause will be the same in every swis- undiderrelar case.

The number of individuals in a social unit, the necessity or undesirability of communal action for obtaining the necessary food supply give dynamic conditions that are active everywhere and that are germs from which analogous cultural behavior may spring.

Besides these, there are individual cases of inven-

tions or ideas in lands far apart that can not be proved to be historically connected. The fork was used in Fiji and invented comparatively recently in Europe: the spear, projected by a thong wound spirally about the shaft, was used on the Admiralty Islands and in ancient Rome. In some cases the difference in time makes the theory of a transfer all but unthinkable. This is the case, for instance, with the domestication of mammals in Peru, the invention of bronze in Peru and Yucatan and that of the zero in Yucatan.

Some anthropologists assume that, if a number of cultural phenomena agree in regions far apart, these must be due to the presence of an exceedingly ancient substratum that has been preserved notwithstanding all the cultural changes that have occurred. This view is not admissible without proof that the phenomena in question remain stable not only for thousands of years, but even so far back that they have been carried by wandering hordes from Asia to the extreme southern end of South America. Notwithstanding the great tenacity of cultural traits, there is no proof that such extreme conservatism ever existed. The apparent stability of primitive types of culture is due to our lack of historical perspective. They change much more slowly than our modern civilization, but wherever archeological evidence is available we do find changes in time and space. A careful investigation shows that those features that are assumed as almost absolutely stable are constantly undergoing changes. Some details may remain for a long time, but the general complex of culture can not be assumed to retain its character for a very long span of time. We see people who were agricultural become hunters, others change their mode of life in the opposite direction. People who had totemic organization give it up, while others take it over from their neighbors.

It is not a safe method to assume that all analogous cultural phenomena must be historically related. It is necessary to demand in every case proof of historical relation, which should be the more rigid the less evidence there is of actual recent or early contact.

In the attempt to reconstruct the histery of modern races we are trying to discover the earlier forms preceding modern forms. An analogous attempt has been demanded of cultural history. To a limited extent it has succeeded. The history of inventions and the history of science show to us in course of time constant additions to the range of inventions, and a gradual increase of empirical knowledge. On this basis we might be inclined to look for a single line of development of culture, a thought that was preeminent in anthropological work of the end of the past century.

The fuller knowledge of to-day makes such a view

ot be

Was

ly in

ound

ralty

dif.

l but

1 the

n of o in

r of

hese

ient

ling

iew

ena

of

intenable. Cultures differ like so many species, perhaps genera, of animals, and their common basis is lost forever. It seems impossible, if we disregard invention and knowledge, the two elements just referred to, to bring cultures into any kind of continuous series. Sometimes we find simple, sometimes complex, social organizations associated with crude inventions and knowledge. Moral behavior, except in so far as it is checked by increased understanding of social needs, does not seem to fall into any order.

It is evident that certain social conditions are incompatible. A hunting people, in which every family
requires an extended territory to insure the needed
food supply, can not form large communities, although it may have intricate rules governing marriage.
Life that requires constant moving about on foot is
incompatible with the development of a large amount
of personal property. Seasonal food supply requires
a mode of life different from a regular, uninterrupted
food supply.

The interdependence of cultural phenomena must be one of the objects of anthropological inquiry, for which material may be obtained through the study of existing societies.

Here we are compelled to consider culture as a whole, in all its manifestations, while in the study of diffusion and of parallel development the character and distribution of single traits are more commonly the objects of inquiry. Inventions, economic life, social structure, art, religion, morals are all interrelated. We ask in how far are they determined by environment, by the biological character of the people, by psychological conditions, by historical events or by general laws of interrelation.

It is obvious that we are dealing here with a different problem. This is most clearly seen in our use of language. Even the fullest knowledge of the history of language does not help us to understand how we use language and what influences language has upon our thought. It is the same in other phases of life. The dynamic reactions to cultural environment are not determined by its history, although they are a result of historical development. Historical data do give us certain clues that may not be found in the experience of a single generation. Still, the psychological problem must be studied in living societies.

It would be an error to claim, as some anthropologists do, that for this reason historical study is irrelevant. The two sides of our problem require equal attention, for we desire to know not only the dynamics of existing societies, but also how they came to be what they are. For an intelligent understanding of historical processes a knowledge of living processes is as necessary as the knowledge of life

processes for the understanding of the evolution of life forms.

The dynamics of existing societies are one of the most hotly contested fields of anthropological theory. They may be looked at from two points of view, the one, the interrelations between various aspects of cultural form and between culture and natural environment; the other the interrelation between individual and society.

Biologists are liable to insist on a relation between bodily build and culture. We have seen that evidence for such an interrelation has never been established by proofs that will stand serious criticism. It may not be amiss to dwell here again on the difference between races and individuals. The hereditary make-up of individuals has a decided influence upon their mental behavior. Pathological cases are the clearest proof of this. On the other hand, every race contains so many individuals of different hereditary make-up that the average differences between races freed of elements determined by history can not readily be ascertained, but appear as insignificant. It is more than doubtful whether differences free of these elements can ever be established.

Geographers try to derive all forms of human culture from the geographical environment in which man lives. Important though this may be, we have no evidence of a creative force of environment. All we know is that every culture is strongly influenced by its environment, that some elements of culture can not develop in an unfavorable geographical setting, while others may be advanced. It is sufficient to see the fundamental differences of culture that thrive one after the other in the same environment, to make us understand the limitations of environmental influences. The aborigines of Australia live in the same environment in which the White invaders live. The nature and location of Australia have remained the same during human history, but they have influenced different cultures. Environment can affect only an existing culture, and it is worth while to study its influence in detail. This has been clearly recognized by critical geographers, such as Hettner.

Economists believe that economic conditions control cultural forms. Economic determinism is proposed as against geographic determinism. Undoubtedly the interrelation between economics and other aspects of culture is much more immediate than that between geographical environment and culture. Still it is not possible to explain every feature of cultural life as determined by economic status. We do not see how art styles, the form of ritual or the special form of religious belief could possibly be derived from economic forces. On the contrary, we see that economics

and the rest of culture interact as cause and effect, as effect and cause.

Every attempt to deduce cultural forms from a single cause is doomed to failure, for the various expressions of culture are closely interrelated and one can not be altered without having an effect upon all the others. Culture is integrated. It is true that the degree of integration is not always the same. There are cultures which we might describe by a single term, that of recent times as individualistic-mechanical; or that of a Melanesian island as individualization by mutual distrust; or that of our Plains Indians as overvaluation of intertribal warfare. Such terms may be misleading, because they overemphasize certain features, still they indicate certain dominating attitudes.

Integration is not often so complete that all contradictory elements are eliminated. We rather find in the same culture curious breaks in the attitudes of different individuals, and, in the case of varying situations, even in the behavior of the same individual.

The lack of necessary correlations between various aspects of culture may be illustrated by the cultural significance of a truly scientific study of the heavenly bodies by the Babylonians, Maya and by Europeans during the Middle Ages. For us the necessary correlation of astronomical observations is with physical and chemical phenomena; for them the essential point was their astrological significance, *i.e.*, their relation to the fate of man, an attitude based on the general historically conditioned culture of their times.

These brief remarks may be sufficient to indicate the complexity of the phenomena we are studying, and it seems justifiable to question whether any generalized conclusions may be expected that will be applicable everywhere and that will reduce the data of anthropology to a formula which may be applied to every case, explaining its past and predicting its future.

I believe that it would be idle to entertain such hopes. The phenomena of our science are so individualized, so exposed to outer accident that no set of laws could explain them. It is as in any other science dealing with the actual world surrounding us. For each individual case we can arrive at an understanding of its relations to inner and outer forces, but we can not explain its individuality in the form of laws. The astronomer reduces the movement of stars to laws, but unless given an unexplainable original arrangement in space, he can not account for their present location. The biologist may know all the laws of ontogenesis, but he can not explain by their means the accidental forms they have taken in an individual species, much less those found in an individual.

Physical and biological laws differ in character on

account of the complexity of the objects of their study. Biological laws can refer only to biological forms, as geological laws can refer only to the forms of geological formations. The more complex the phenomena, the more special will be the laws expressed by them.

Cultural phenomena are of such complexity that it seems to me doubtful whether valid cultural laws can be found. The causal conditions of cultural happenings lie always in the interaction between individual and society, and no classificatory study of societies will solve this problem. The morphological classification of societies may call to our attention many problems. It will not solve them. In every case it is reducible to the same source, namely, the interaction between individual and society.

It is true that some valid interrelations between general aspects of cultural life may be found, such as between density and size of the population constituting a community and industrial occupations; or solidarity and isolation of a small population and their conservatism. These are interesting as static descriptions of cultural facts. Dynamic processes also may be recognized, such as the tendency of customs to change their significance according to changes in culture. Their meaning can be understood only by a penetrating analysis of the human elements that enter into each case.

In short, the material of anthropology is such that it needs must be a historical science, one of the sciences the interest of which centers in the attempt to understand the individual phenomena rather than in the establishment of general laws which, on account of the complexity of the material, will be necessarily vague and, we might almost say, so self-evident that they are of little help to a real understanding.

The attempt has been made too often to formulate a genetic problem as defined by a term taken from our own civilization, either based on analogy with forms known to us or contrasted to those with which we are familiar. Thus concepts, like war, the idea of immortality, marriage regulations, have been considered as units and general conclusions have been derived from the forms and distributions. It should be recognized that the subordination of all such forms, under a category with which we are familiar on account of our own cultural experience, does not prove the historical or sociological unity of the phenomenon. The ideas of immortality differ so fundamentally in content and significance that they can hardly be treated as a unit and valid conclusions based on their occurrence can not be drawn without detailed analysis.

A critical investigation rather shows that forms of thought and action which we are inclined to consider as based on human nature are not generally valid, but . 1983

study.

forms,

ms of

phe-

ressed

hat it

s can

ppen.

idual

ieties

ifica-

prob. it is

etion

ween

h as

con-

; Or

and

atic

sses

us-

ges

nat

ci-

characteristic of our specific culture. If this were not so, we could not understand why certain aspects of mental life that are characteristic of the Old World should be entirely or almost entirely absent in aboriginal America. An example is the contrast between the fundamental idea of judicial procedure in Africa and America; the emphasis on oath and ordeal in the Old World, their absence in the New World.

The problems of the relation of the individual to his culture, to the society in which he lives have received too little attention. The standardized anthropological data that inform us of customary behavior, give no clue to the reaction of the individual to his culture, nor to an understanding of his influence upon it. Still, here lie the sources of a true interpretation of human behavior. It seems a vain effort to search for sociological laws disregarding what should be called social psychology, namely, the reaction of the individual to culture. They can be no more than empty formulas that can be imbued with life only by taking account of individual behavior in cultural settings.

Society embraces many individuals varying in mental character, partly on account of their biological make-up, partly due to the special social conditions under which they have grown up. Nevertheless, many of them react in similar ways, and there are numerous cases in which we can find a definite impress of culture upon the behavior of the great mass of individuals, expressed by the same mentality. Deviations from such a type result in abnormal social behavior and, although throwing light upon the iron hold of culture upon the average individual, are rather subject-matter for the study of individual psychology than of social psychology.

If we once grasp the meaning of foreign cultures in this manner, we shall also be able to see how many of our lines of behavior that we believe to be founded deep in human nature are actually expressions of our culture and subject to modification with changing culture. Not all our standards are categorically determined by our quality as human beings, but may change with changing circumstances. It is our task to discover among all the varieties of human behavior those that are common to all humanity. By a study of the universality and variety of cultures anthropology may help us to shape the future course of mankind.

CONQUEST OF THE PHYSICAL WORLD'

By Professor BERGEN DAVIS

COLUMBIA UNIVERSITY

According to the traditions of an ancient people, the progenitors of mankind, after tasting the delights of the fruit of the tree of knowledge, were commanded to "subdue the earth and have dominion over it." It is perhaps not an accident that the love of knowledge and the love of conquest are thus coupled together. It is rather a fundamental psychological association. "Knowledge is power" has become a proverb of the race.

"Subdue the earth" has had diverse expressions in fact. The career of man over the face of the globe has largely been one of destruction. The forests were destroyed. The hidden minerals, the noble and the useful metals were dug from the earth and dissipated. A later form of this ruthless destruction has been the irreversible dissipation of our stores of energy in the form of coal, oil and natural gas.

The phenomena, and the forces of nature seem to have oppressed the primitive mind with awe and fear. The savage man worshipped these awful forces as gods, while the progress of civilization may be measured in terms of the extent of the conquest and reduction of these natural forces to our uses.

The love of knowledge and the love of conquest

¹ Address of the retiring vice-president of Section B—Physics, American Association for the Advancement of Science, Atlantic City, December, 1932.

have been expressed through our impulses. There are impulses for discovery and for adventure. The original idea of conquest and adventure was to seek new lands, to explore and subdue and often to destroy other peoples. That there may be other adventures and other conquests is an idea of recent origin. The unknown domains that the primitive man fears, the civilized man conquers. Here are new opportunities for discovery, for conquest and for adventure. This is the finest type of conquest and adventure. In the pursuit of knowledge we injure no one and in its acquisition we benefit many.

Men dream of the excitements and the adventures of exploration of unknown lands, of the ascent of a mountain or the conquests of the air. These may be thrilling adventures. Both in value and thrill they are not to be compared to the discovery of a new phenomenon or a new law of nature. The conquest of a mountain or a pole, like those other conquests "sung by the Troubadours," lose their thrill with their accomplishment. The conquests and adventures of science are inexhaustible. There are always new lands to conquer. This is the real "Endless Adventure," rather than the pursuit of a transient political life.

The allotted time for this address will not permit

even a partial survey of the conquest of the physical world. I must, however, allude to an early and a thrilling adventure. I refer to the conquest of the heavens. The discoveries of Tycho Brahe, Keppler and Galileo placed the ideas of Copernicus on a firm foundation. The earth and man are not the center of things. We take our proper place as humble citizens of a larger and more wonderful universe. The establishment of observation and experiment in science was also a conquest of first importance. Quantitative experiment and logical induction superseded the older and often erroneous inferences of a deductive philosophy. The results of the quantitative experiments of Galileo were given a precise and logical statement by Newton in the "Three Laws of Motion."

The nature of matter has been a continuous subject of speculation since the time of the Greeks. It has only recently become the object of experiment. The activities of the alchemists resulted in the development of the new science of chemistry as a branch of natural philosophy. An early generalization of these studies was the concept of the conservation of matter. That matter was neither created or destroyed in the processes of chemical action was established by the quantitative experiments of La Voisier. These ideas about the conservation of matter and the transmutation of the alchemists are of great interest in the light of recent events.

Closely allied with the question of the nature of matter was the nature of heat. Many philosophers at the close of the eighteenth century considered heat to be a form of matter. The American adventurer, Count Rumford, showed conclusively that the heat developed by friction depended on the mechanical effort of overcoming that friction. To Count Rumford heat was work. The further researches of Carnot, Meyer, Joule and others completed the identification of heat as a form of energy before the middle of the nineteenth century. A second great generalization was established, that of the conservation of energy.

Another major conquest of the nineteenth century was that of the nature of light and radiations in general. Here the corpuscular ideas of Newton gave way to the wave theory and experiments of Young and Fresnel. The researches of Faraday into the phenomena of electricity and magnetism led him to expect a connection between light and electricity. Later Maxwell formulated and extended these ideas into the beautiful electro-magnetic theory of light. In our very brief and partial survey we are nearing the close of the nineteenth century, but we must not leave the century without reference to the conquest of space by Heinrich Hertz. I refer to the propagation of electric waves, the sequel of which is the radio communication of the present day.

A new era has come. A new world was discovered at the end of the last century, which is being rapidly conquered and settled in the twentieth century. In introducing the conquests of modern physics, I can not refrain from quoting from an address by Lord Salisbury at the opening of the British Association for the Advancement of Science in 1888: "We stand to-day on a bright oasis of knowledge in an illimitable desert of the unknown." The twentieth century adventurers have enlarged the oasis but the desert is still without limit. The present is an age of conquest and adventure. It has been called the Elizabethan age of romance and discovery in science. The adventurer in science like those other adventurers may sail uncharted seas into the unknown. The chances of discovering new lands are great indeed.

Two venturesome explorers set forth into the unknown in the last decade of the nineteenth century. (a) The discovery by Roentgen of a new radiation from vacuum tubes operated at high voltages; (b) The discovery of the radioactivity of pitchblende by Becquerel. These were not unrelated discoveries. They opened up new realms of ideas as to the nature of matter, of electricity and of energy. Many in this room have taken part in the rapid conquests that followed these two discoveries. The younger members are familiar with it as recent history of our science. One major result was the identification of matter with electricity, whatever they may be. It was conclusively shown that electricity is not a continuum, but is composed of discrete particles of definite charge and mass. Electrical currents are but the coordinated motion of these particles, thus reviving the older ideas of Weber and Riemann. The first of these primordial particles to be isolated and studied was the electron. It was established by the direct experiments of Kaufman, that the mass of an electron was not constant but depended on its velocity. Mass was related to energy. As early as 1881 Sir J. J. Thomson had shown that an electrical charge should have mass. After the discovery of the electron this idea was more precisely developed by Lorentz. The theory of Lorentz relating mass and energy was later confirmed by the experiments of Bucherer. The theory of delayed potential of Lorentz contains not only the dependence of space coordinates on velocity, but time itself is a function of the velocity. These expressions are known to us all as the Lorentz transformation equations. These ideas were later given a more general expression by Einstein in what is now known as the special relativity theory. Both theory and experiment had shown the identity of matter and electricity. The generalization of Einstein had identified these two with a single universal entity, namely energy. This conception of the identity of mass and energy was

ed

lly

In

an

rd

n

id

le

st

not new with the relativity theory. A relation between the mass and energy of an electric charge had previously been derived. The expression, however, for the energy contained a geometrical factor and was not universal and independent of form.

We have already referred to that great conquest of the nineteenth century, the electro-magnetic theory of light. The production of large scale electric waves had been demonstrated by Hertz. The corresponding origin of light waves could only be surmised. The discovery of the electron illuminated what before had been dim and obscure. A closer study of radiation showed this concept of its origin to be incomplete. Here again a bold advance was made into the desert of the unknown. A new period of discovery and conquest was begun. I refer to the quantum of radiant energy discovered by Planck. Energy is no longer a continuum, it is atomistic like matter. Energy, matter, electricity are all atomistic. They are entities having discrete existence in both time and space.

New settlers rapidly filled the El Dorado discovered by those two adventurers of 1895–1896. Great realms were founded in the new lands. Great conquerors arose such as Professor and Madame Curie and Lord Rutherford. The founding of the radium "family" was a remarkable analysis and penetration into obscure and difficult experiments, such as the world has seldom seen. Now rapidly followed the nuclear atom of Rutherford and Bohr. The processes of the radiation and absorption of energy were clarified. The "jungle" of the spectra had been subdued. The Bohr theory of the atom was a splendid triumph even though we may abandon some of the concepts underlying its original structure.

We come now to the nucleus of the atom and to nuclear physics. The scattering of a-particles showed that these positively charged particles were repelled from the atomic center according to the inverse square law and that they approached within 10-12 centimeters of this center. A distance thousands of times less than the accepted dimensions of an atom. So Rutherford pictured the atom as a positively charged nucleus surrounded by numerous neutralizing electrons. This picture of the nucleus involves that radioactivity is a nuclear phenomena, and that radioactive transformation is a nuclear disintegration. The whole sequence of descent in the radium family was shown to be but the emission of a-particles or electrons or both from the nucleus. Matter is thus capable of self transformation. Can this process be brought about artificially? An affirmative answer was encouraged by the discovery of the isotope. In spite of fractional atomic weights the masses of atoms were found to be integer multiples of a unit, the hydrogen atom. Moreover the more precise measurements of Aston showed that

there was a small change of mass in the process of atom building. Artificial transformation was first accomplished by Rutherford in 1919. The bombardment of nitrogen and aluminium by α-particles produced hydrogen nuclei (protons), moving with very great speeds. Projectiles of high energy were required to produce this transformation. Two builders of ordnance, E. O. Lawrence and Robert J. Van de Graff, have recently constructed great guns for this bombardment. The object in view being to hurl atomic projectiles with an energy as great as that of α-particles.

The nucleus of the atom had already been successfully bombarded by Rutherford, but the fortress was not completely reduced until a few months ago. I refer to the significant discovery of Cockcroft and Walton that protons having energy as small as 120,000 electron-volts could disrupt the lithium atom. More remarkable still, two α-particles were ejected having a combined energy of 16,000,000 electron-volts. Nuclear energy was set free by artificial means. To my mind this is a landmark in the conquests of physical science. It is also the beginning of an economic revolution.

NUCLEAR CHEMISTRY

In molecular chemistry we have endo-thermic and exo-thermic processes. So also in nuclear chemistry. The type of disintegration referred to was an exergic process. All processes of nuclear transformation may be considered as either endergic or exergic. Here we have the beginnings of the chemistry of the nucleus. This I believe will be the great field of physical and chemical research of the twentieth century. I wish to go more in detail into this chemistry of the future. Atoms may be classified into nuclear types: (a) nuclei of (4n+0) type, (b) (4n+1) type, (c) (4n+2) type and (d) (4n+3) type. The integers 0, 1, 2, 3 refer to the number of uncombined protons in the nucleus. In the case of the (4n+3) type, the bombarding proton unites with the three free protons forming a new α-particle. This involves a decrease in mass and a corresponding liberation of energy. The process may be written $(4n+3) + H^1 \rightarrow 2$ a-particles + energy. The hydrogen isotope H² has recently been discovered. The isotope H³ probably exists. With these three types of protons one may expect processes:

$$(4n+3) + H^1 \rightarrow q (\alpha - p) + E.$$

$$(4n+2) + H^2 \rightarrow q (\alpha - p) + E.$$

$$(4n+1) + H^3 \rightarrow q (\alpha - p) + E.$$

These types include a considerable portion of the elements. These processes are all exergic. The mass decreases and energy is liberated. Only a small initial energy is required to start the action. It is identical

b

in type with the ordinary union of hydrogen and oxygen in which a small initial energy starts a great explosion. I append a short table of a few possible nuclear chemical processes together with the energies involved.

```
4H^1 + 2e \rightarrow \alpha-particle (\alpha-p) + 27 \times 10^6 electron volts
 H^1 + H^1 + e \rightarrow (H^2)
                                                    +2 ×10°
 H^3 + H^2 \rightarrow (\alpha - p)
                                                    +23×10°
\text{Li}_{\tau} + \text{H}^{1} \rightarrow 2 \ (\alpha - p)
                                                    +14×10°
B_{ii} + H^i \rightarrow 3 (\alpha - p)
                                                    +10×10°
B^{11} + H^1 \longrightarrow C_{12}
                                                    +14×104
\mathrm{Fl}_{19} + \mathrm{H}^1 \longrightarrow \mathrm{O}_{16} + (\alpha - \mathrm{p})
                                                    + 5×10°
Fl_{10} + H^1 \rightarrow 5 (\alpha - p)
                                                    -2.8 \times 10^{6}
\mathrm{Fl}_{19} + \mathrm{H}^{1} \longrightarrow \mathrm{Ne}
                                                    + 7×10°
                                                   type
\text{Li}_6 + \text{H}^2 \rightarrow 2 \ (\alpha - p)
                                                    +20×10°
B_{10} + H^2 \rightarrow 3 (\alpha - p)
                                                    +18×104
B_{10} + H^2 \longrightarrow C_{12}
                                                    +21×10°
```

The proton rather than the neutron is taken as a unit building block, since the mass of the neutron is not yet definitely determined.

The isotope H^3 while probably existing in nature has not yet been observed. The process $(4n+1)+H^3$ will not be discussed. The above processes with one exception are all exergic. The possible endergic processes will not be here considered. In examining this table we observe that, as in the case of molecular chemical processes, the more stable compounds show the greater energy. There can be no doubt that the α -particle is a very stable nucleus. Next to the proton it is the best type of projectile for nuclear bombardment. The projectile is not easily disrupted by the impact.

The amount of energy available in any nuclear transformation may be taken as a measure of the nuclear chemical affinity. In molecular chemical action, where two processes are possible, that one is more probable which liberates the greater energy. From this point of view the process $(B_{11} + H^1) \rightarrow$ $C_{10} + 14 \times 10^6$ electron volts is more probable than the alternative formation of $3(\alpha - p) + 10 \times 10^6$ electron volts. In this case one might expect the formation of C12, also one should expect the energy to appear as a photon. On the other hand in the experiment of Cockcroft and Walton the emission of α-particles was actually observed. This idea that the probability of capture should depend on the free energy is confirmed by the recent results of Cockcroft and Walton. It was found that the relative probability of capture of a proton by lithium, boron and fluorine was 10,000, 4,000 and 1,350; the corresponding ranges of the α-particles observed were 8.5 cm, 3.5 cm and 2.8 cm, respectively. Successful theories of these types of nuclear processes should contain a free energy term either implicitly or explicitly.

The possible types of transformation in which no free α -particle is produced are of great interest. Such processes are illustrated by $(B_{11}+H^1) \rightarrow C_{12}+E$ and $(B_{11}+H^2) \rightarrow C_{12}+E$. If no α -particles are formed and the process occurs the energy should be emitted as gamma radiation. From the purely mechanical point of view both the energy and the momentum may be conserved. Since the mass of the photon is small it will contain the greater part of the energy. If continued experiments fail to find such radiation that fact will be of great importance in the theories of nuclear transformation.

The (nucleus + H²) process will not be further discussed except to point out that $(\text{Li}_6 + \text{H}^2) \rightarrow 2 \ (\alpha - p) + \text{E}, \ (\text{B}_{10} + \text{H}^2) \rightarrow 3 \ (\alpha - p) + \text{E}$ and $(\text{B}_{10} + \text{H}^2) \rightarrow C_{12} + \text{E}$ are all probable processes since the free energy is very great.

This nuclear chemical action is not of rare occurrence. Cockcroft and Walton report that about one portion in 10° bombarding protons united with the lithium nucleus. The ratio of cross-section of the lithium atom to its nucleus is about 10°. Taking into account the depth of penetration of a high speed proton the probability of capture is not exceedingly small.

The same energy laws of chemical action probably obtain here as they do in the more familiar molecular chemistry. The endergic processes require a supply of energy. This view is confirmed by such types of disintegration as observed in the bombardment of nitrogen and aluminium by α -particles. The mass change involved, while small, appears to be an increase. There is no available energy except that of the impacting α -particle. The observed energy of the emitted protons is of the same order as that of the impacting α -particles.

The great "chemical" affinity of the lithium nucleus for a proton is indicated by the following considerations. Investigation of scattering of a-particles from atoms show that they are repelled according to the inverse square law of force to a distance of approach of less than 10-12 centimeters. This determines the order of the dimensions of the nucleus of an atom. Experiments of this type indicate that the radius of the lithium nucleus is about 5×10^{-13} centimeters. The approaching proton is also repelled by this same law of force. The experiments of Cockcroft and Walton gave capture of a proton at an energy as small as 120,000 electron-volts. At this energy a proton can approach only to a distance of 10-11 centimeters from the lithium nucleus. This distance is twenty times greater than the probable radius of the nucleus. In spite of this great distance the affinity is great enough to cause capture.

The chemistry of the nineteenth century was a

ch

nd

ed

ed

al

y

chemistry of atoms and molecules. It was largely a wet chemistry. The chemistry of the twentieth century will be that of the nucleus. It will be dry. The younger men may well see and take part in a remarkable revolution in physical science and in industry. Enormous stores of energy will be made available and mankind will be largely relieved from physical toil.

The methods of using this nuclear energy are not yet developed, but new discoveries will be made. The difficulties will be rapidly overcome. One might imagine the following hypothetical process: The bombardment of aluminium by α-particles gives high energy protons. The bombardment of lithium by protons gives high energy α-particles. By bombarding a mixture of aluminium and lithium with protons the future physicist may start a process similar to but much more intense than the more familiar thermite reaction. The mixture in a certain sense is an explosive

mixture. It contains within itself the possibility of maintaining the action if it is once started.

The structure of the nucleus and its energy processes will become the commonplace of the newer physics. New discoveries will be made. One can even imagine the future physicist studying a divisible proton and electron as we study a divisible nucleus at the present day. It is unphilosophical to set a limit to the conquests of physical science. Man has not exhausted the secrets of nature in a few centuries. There are many things undreamed of in our philosophy.

To the younger physicist I would say it is a great thing to be young in this year 1932. The opportunities for discovery are very great indeed, much greater than for Faraday one hundred years ago.

The oasis of knowledge has been much enlarged, the desert of the unknown is still without limit.

OBITUARY

WILLIAM SYDNEY THAYER

In the sudden death of Dr. William Sydney Thayer, at the age of sixty-eight, from a heart attack on December 10, the medical world lost an outstanding teacher and investigator—one who had been actively and successfully at work in the Johns Hopkins Hospital and Medical School for over forty years, an important contributor to the national and international prestige that those institutions enjoy.

Born in Milton, Massachusetts, on June 23, 1864, Dr. Thayer came from a distinguished family, of which Ralph Waldo Emerson and Oliver Wendell Holmes had been members. His father, James Bradley Thayer, was professor of law at Harvard, and his brother, Ezra Thayer, became dean of the Harvard Law School. In 1901, Dr. Thayer married Susan Chisolm Read, of Charleston, South Carolina. One of the great sorrows of his life was her prolonged invalidism, and her premature death in 1917. Of his immediate family only one sister, Mrs. John W. Ames, of Cambridge, Massachusetts, survives him.

In his physique and character, in his love of scholarship, and in his standards and ideals, Dr. Thayer was consonant with our ideas of the best that New England blood and training have to give. He graduated in arts at Harvard University in 1885 and received his medical degree from the Harvard Medical School in 1889. He served as interne in the Massachusetts General Hospital, engaged in postgraduate studies in Berlin and Vienna, and worked for a brief period as a general practitioner in Boston. In 1890, he joined Professor Osler's house-staff in the Johns Hopkins Hospital, acting first as "differentiating"

physician" for the out-patient department and, later, serving for seven years as resident physician. For many years he was professor of clinical medicine in the Johns Hopkins Medical School; in 1919 he became professor of medicine in the university and physician-in-chief to the hospital; and, in 1921, resigning the active professorship (to be succeeded by Professor Warfield T. Longcope) he continued as professor emeritus of medicine until the time of his death.

Dr. Thayer believed that internists holding university positions should not only be able practitioners and skilful teachers but should also exhibit intellectual curiosity and should engage therefore in the work of original research; throughout his career in Baltimore he set a laudable example in these several types of activity.

As an original investigator he made many important contributions to inner medicine, among which may be mentioned especially the results of his studies of the blood in leukemia (1891), in typhoid (1895), and in malaria (1893-1900) and of his researches upon the third heart sound (1908-9), upon cardiac murmurs (1901; 1919), upon the cardiovascular complications and sequels of typhoid fever (1903-4), upon chorea (1906), upon arteriosclerosis (1904), upon heartblock (1916) and upon gonococcal endocarditis and endocarditis lenta. He inspired younger men to undertake researches with him, and with some of them (G. Blumer, C. E. Brush, M. Fabyan, H. H. Hazen, J. Hewetson, J. W. Lazear, W. G. MacCallum, R. S. Morris, F. W. Peabody, B. H. Rutledge and G. H. Whipple) he made joint publications. It is interesting, too, that during his lifetime he had made

a number of reports upon angina pectoris, a malady from which he himself began to suffer some three years before his death.

As a teacher of medical students and of physicians after graduation, Dr. Thayer showed from the beginning exceptional ability. He, himself, regarded association with the young as the greatest privilege of the teacher-"the best vaccine against age and apathy." He was a clear thinker himself and had no difficulty in making things clear to others. He had no patience with slipshod work. From the time of his return from Ehrlich's laboratory in 1890, armed with the technique of the differential staining of blood smears, he was ever interested in the application of the methods of the clinical laboratory to diagnosis, and he drilled his students thoroughly in their use. At his ward-rounds and in his amphitheater clinics he knew how enthusiastically and skilfully to interweave the facts of the science with the technique of the art of medicine to the advantage of the teaching of both. His appreciation of careful anamnestic records, of painstaking and accurate physical examinations, of adequate laboratory tests and of systematic observations of the course of maladies in single patients created admiration and spurred his assistants and his students to their best endeavors. He was a great admirer of Laennec and often told his pupils of the life and work of the French clinician. Representing the United States, Dr. Thayer, in December, 1926, made an address in French at the ceremonies celebrating the centenary of Laennec's birth.

For many years Dr. Thayer and Dr. W. G. Mac-Callum held weekly clinical-pathological conferences, at which the students first heard the reports of the clinical studies and of the diagnostic conclusions that had been arrived at and then listened to descriptions of the actual findings at autopsy; through attendance upon these conferences they learned many salutary lessons and developed their powers of critical evaluation of data. It was Dr. Thayer's belief that it is "not the teacher's duty to feed the student with assertions but to teach him how to teach himself." That he was a master of English was very evident in his oral teaching and in all that he wrote. He also spoke and read French and German, as well as some Italian and Russian; and he encouraged his students to make free use of the library in order to acquaint themselves with the present status and the development of knowledge pertaining to the clinical cases under study. Dr. Thayer was a member of the editorial board of the Archives of Internal Medicine. In addition to his published researches, he contributed to medical literature many papers that are prized for their educational value. He was selected to deliver the Bright Lectures

(London, 1927), the Gibson Lectures (Edinburgh, 1930) and the Frank Billings Lecture (1932).

As a practitioner, in addition to his care of patients in the hospital, Dr. Thayer was much in demand as a consultant. He was called by his colleagues not only in Baltimore and Washington, but in all parts of the United States, when they desired aid in cases in which diagnosis had been difficult or in which the sharing of serious responsibility seemed to be important. His clinical judgment (gained through long experience) concerning the relative significance of deviations from the normal when they were multiple and of the order in which measures of treatment should be applied in a given case was highly valued. In therapy he was neither a nihilist nor an over-credulous polypragmatist. He valued drugs in their proper use, though he strongly opposed their abuse; and he was constantly emphasizing the efficacy of the simpler methods of physical and psychical therapy rationally planned and applied. He understood the great importance of the direct personal relationship of physician to patient and was adept in establishing and maintaining it. Charming in manner and obviously straightforward, he quickly inspired a confidence in his patient that later ripened into an enduring trust.

As a friend he was sincere and faithful, sharing in the joy of another's success, but not hesitating to admonish when he saw tendency to what he believed to be error. He numbered among his close friends many of the leaders in medicine in this country and abroad. His especial capacity for friendship is obvious to the reader of his published notes upon Hewetson, Kanthack, Lazear and Howland and, especially, of his fine appreciation of his great master and friend, the first professor of medicine at Johns Hopkins.

Though known internationally by his scientific work, Dr. Thayer achieved further renown in foreign countries through his membership in the American Red Cross Mission to Russia (1917-18), and through his services as major, colonel and brigadier-general of the Medical Corps of the U.S. Army and as chief medical consultant of the American Expeditionary Force in France (1918-19). As a result of these several activities and of his contributions to medical knowledge, he was multiply honored, receiving the distinction badge of the Red Cross of Russia (1918), the Distinguished Service Medal of our own country (1919) and a Commandership in the Legion of Honor of France (1928); besides, he was made fellow, or honorary member, of more than a dozen foreign medical academies and societies. In America, he held membership in many important medical and scientific associations, was made president of the American

Medical Association (1928-29), and president of the Phi Beta Kappa (1929). He was a member of the board of overseers of Harvard University for two terms and was one of the trustees of the Carnegie Institution of Washington. He received many honorary degrees, including that of LL.D. from Washington College (1927), from Edinburgh University (1927) and from McGill University (1929), that of Doctor of the University of Paris (1928) and that of Sc.D. from the University of Chicago. In May, 1927, a group of his friends made a gift endowing in perpetuity the "William Sydney Thayer and Susan Read Thayer Lectureship in Clinical Medicine," the income to provide for one or more lectures annually in the medical school, the lecturer to be selected from men distinguished in clinical medicine, pediatrics, neurology or border line branches.

Though intensely devoted to medicine, Dr. Thayer knew the importance of rest, recreation and diversion. He was an ardent sportsman and spent many of his summer vacations with a few boon companions in the wilds, making use of rod and gun. He enjoyed the company of congenial persons in dinner clubs and other social groups. He spent much time in reading good literature and had an intimate acquaintance with

the works of the better writers, especially the French. He was fond of poetry, learned many favorite poems by heart and wrote some verse himself. He was known to his friends as a lover of books, of people and of nature.

In the portrait of Dr. Thayer, painted by Leopold Seyffert, he appears in the U. S. uniform that he wore in France. A bronze tablet by J. Maxwell Miller (1912) is also much admired by those who knew him well.

A rare man, of unique personality—simple, courteous, attractive, high-minded, of unalterable integrity, just, tolerant and lovable—a cultivated man of many talents and of excellent qualities! In his death, Dr. Thayer's colleagues and friends and all who were fortunate enough to have the privilege of actual association with him experience a profound sense of sorrow and of personal loss; and internal medicine in the world at large laments the passing of a truly distinguished representative. The new generation, to which falls the task of finding the right way to further progress in clinical medicine, can not fail to be helped by a study of the life of, and by emulation of the example set by, Dr. William Sydney Thayer.

LEWELLYS F. BARKER

SCIENTIFIC EVENTS

SCIENTIFIC WORK UNDER THE GOVERNMENT

THE Scientific Monthly in its January number begins a series of articles on the scientific work of the government. President Hoover contributes an introduction and the Department of Agriculture is taken up first with articles by Secretary Arthur M. Hyde and Dr. A. F. Woods, director of scientific work. The introduction by President Hoover reads as follows:

The insatiable curiosity of the human mind to probe the mysteries of Nature through scientific research into the operation of natural laws has resulted in such wealth of new inventions and new products, so satisfying to material needs of the people, that the world is irrevocably committed to an eternal quest of further truth, with certainty of endless and ever more rapid change as new knowledge is translated into new conveniences and comforts. The social relations of mankind have already been altered by these changes beyond the utmost imagination of our forefathers. Further and more revolutionary changes will be wrought.

As government is the art of social relations under recognized authorities set up by the will of the people, any change wrought by scientific advance quickly produces new problems of government. The Federal Government itself long ago sensed the potentialities of science when it gave official status to the Smithsonian

Institution. From that pioneer body has flowed a stimulation to scientific research of the most valuable character, both directly in its own discoveries and indirectly through its leadership and inspiration of private institutions. Science is also recognized and encouraged by the Federal Government in the researches of the Department of Agriculture in biology, entomology and other fields; and similarly in other Departments which promote research. Thus the Government still does, and increasingly should, lead the way by example toward the discovery of new knowledge to free mankind from ignorance, superstition, needless fears and poverty. Nor should it be unremarked that a spiritual value accrues in all this labor, for science requires a degree of unselfishness and devotion which calls out the finest qualities of the human spirit, and, since its goal is truth, the noblest aspirations of mankind.

THE NEW REFRACTING TELESCOPE OF THE FRANKLIN INSTITUTE

Announcement is made by the Franklin Institute in Philadelphia, of the completing in Germany of the 10-inch refracting telescope with the "Urania" type of mounting, for installation in the new Benjamin Franklin Memorial and the Franklin Institute, now under construction on the Parkway.

The telescope will be the first of its kind in the country, the mounting being planned to overcome the

necessity of the observer climbing up ladders to look through the eyepiece. It is called the "Urania" type having been designed for the Urania Observatory of Zurich, Switzerland. Another like it has been installed in the Deutsches Museum, Munich.

Constructed by the Carl Zeiss Works in Jena, the new telescope has been tested and approved in performance and will be shipped during 1933. The 10-inch lens is made for insertion in a 14-foot tube. An electric drive will turn the telescope around the polar axis, to compensate for the motion of the earth.

In order to prevent vibrations from disturbing the observations from the new telescope, it will be specially installed in the museum building with mountings which are independent of the flooring of the building. Supported by a concrete pier, resting on two large beams which reach from wall to wall, the telescope will be practically vibrationless.

A 24-inch reflecting telescope is also under construction in the memorial, by J. W. Fecker, Pittsburgh. Both instruments will be housed on the top floor of the building, a section of the roof being constructed so as to roll back when the telescopes are in use. In addition, a number of smaller telescopes on portable mountings will be used on the roof.

It is expected that the museum, which will include the Fels Planetarium and other departments, will be open in the autumn of 1933.

THE AWARD OF MEDALS OF THE ROYAL SOCIETY TO DR. HALE AND PROFESSOR HABER

THE Royal Society, at its recent annual meeting, as already noted in SCIENCE, awarded the Copley Medal to Dr. George E. Hale and the Rumford Medal to Professor Fritz Haber.

Nature gives extracts from the remarks of the president of the Royal Society, Sir Frederick Gowland Hopkins, who conferred the medals. Concerning Dr. Hale he said:

Dr. Hale's first notable achievement was in 1892, when he brought the spectroheliograph to success. This instrument gives a picture of the sun by the light of one spectrum line, and allows the bright clouds of hydrogen and calcium in the upper regions of the sun's atmosphere to be photographed as projected on the disc. The idea had been suggested and tried much earlier, but Hale was the first to make a workable automatic instrument of this kind. About the year 1895 Hale organized the building of the Yerkes Observatory and of the great refracting telescope there, to which an improved spectroheliograph was adapted. To this period belongs also a masterly investigation of the spectra of certain faint red stars. This was the precursor of a much larger enterprise, the Mount Wilson Observatory, with many unique

instruments, such as the 150 ft. tower telescope and the 100 in. diameter reflector.

At the Mount Wilson observatory Dr. Hale made his great discovery of the Zeeman effect in sun-spots by observing the circular polarization of the edges of the broadened spectrum lines, where they cross the spot. Regions of thousands of miles across were thus shown to be the seat of intense magnetic forces, comparable in strength with those used in the dynamo machine. This discovery has been developed in many important directions.

In recent years Dr. Hale has developed the spectrohelioscope, an instrument depending on the persistence of vision, which allows us to observe transient phenomena searcely accessible to the spectroheliograph. We may confidently expect that it will contribute to clearing up the mysterious relations between terrestrial magnetism and solar phenomena.

In referring to Professor Haber, the president said:

Alike at Karlsruhe, where he went in 1894, and at Dahlem from 1911 to the present time, Haber has inspired schools of great and highly productive activity. His own early studies of the oxidation and reduction of organic substances by electrochemical methods, and the numerous electrochemical studies which followed this important work, such as his researches on gas cells, on the rate of ionic reactions, on the electrolysis of solid salts, on the velocity of reaction at electrodes, and on the use of the glass electrode, have enormously advanced progress in this branch of science.

Haber's profound study of the thermodynamics of gas reactions culminated the synthetic production of ammonia. With van Oort, he carried out a preliminary investigation on the ammonia equilibrium, but owing partly to discrepancy with figures obtained by application of the Nernst theorem, further experiments were made with le Rossignol in 1906. In 1908 satisfactory catalysts had been found and the synthesis of ammonia achieved. The far-reaching technical results of these careful thermodynamical studies are in themselves a monument to Fritz Haber; one of the German factories alone can produce more than 1,000 tons of ammonia daily. The influence of this on the food supply of the world is of the highest importance.

Haber's wide interest, combined with his insight and grasp, made possible the application of modern physical principles to a wide range of problems of physical chemistry, such as the determination of molecular structure and calculation of lattice energies, the nature of the amorphous state, chemiluminescence, reaction kinetics and electron emission during chemical reaction. During the past few years, Haber has been successfully making manifest the rôle of the hydrogen atom in combustion processes.

AWARD OF THE PHILIP A. CONNE MEDAL TO PROFESSOR ABEL

THE Philip A. Conné Medal of the New York Chemists' Club was presented on December 28 to Professor

he

his

b-

he

ot.

Wn

in

his

ec-

0.

ice

_{Da}

ay

up

d:

at

y.

of he n-

18

John J. Abel, of the Johns Hopkins University, at the Atlantic City meeting of the American Association for the Advancement of Science, over which he was presiding.

The presentation was made by Professor D. D. Jackson, of Columbia University, vice-president of the club. The award was made to Dr. Abel for his "pioneer work on the isolation of certain products of animal origin which have been of significance in biology and of value in the treatment of disease. Dr. Abel's achievements include the isolation of insulin, the pancreatic hormone, in crystalline form which made possible the chemical study of this medicinal agent with all that this implies for the sciences of biology and medicine, and the isolation of histamine, a digitalis-like substance from toad skins. One of the earliest achievements in Dr. Abel's career was the isolation of epinephrin, the active substance of the suprarenal gland which is widely used in medicine as a heart stimulant."

The medal was endowed by Mrs. Madelyn Conné, of New York and New Orleans, in memory of her husband. It will be known as "The Philip A. Conné Medal" and will be awarded annually to an individual responsible for a discovery in chemistry which proves of value in medicine, by a jury of award selected by the Chemists' Club from among leaders of both the chemical and medical professions.

In connection with the acceptance of this endowment and the awarding of the first medal, Mr. George C. Lewis, president of the club, made the following statement:

In view of the laudable desire of Mrs. Conné to bring chemistry and medicine closer together in a common effort to alleviate human suffering, The Chemists' Club eagerly accepted the administration of this endowment and the privilege of awarding this honor medal each year. This action on behalf of our trustees is in keeping with the policy which our club has continually followed since its foundation about 30 years ago to further scientific development in every possible way. We indulge the hope that Mrs. Conné's generous action will be an incentive for chemical workers and will result in benefit to suffering humanity.

SCIENTIFIC NOTES AND NEWS

DR. CHARLES L. REESE, retired chemical director of E. I. du Pont de Nemours and Company, Wilmington, Delaware, has been elected president of the American Chemical Society for 1934. Professor Arthur B. Lamb, of Harvard University, becomes president of the society on January 1, and will serve throughout 1933, succeeding Dr. L. V. Redman, vice-president of the Bakelite Corporation. Professor Lamb has served as president-elect during 1932. The society has elected as district directors for 1933 Professor James F. Norris, of the Massachusetts Institute of Technology, and Dean Frank C. Whitmore, of the Pennsylvania State College. Dr. M. C. Whitaker, vice-president of the American Cyanamid Company, New York, was chosen a director-at-large. Councilors-at-large elected were: Professor James B. Conant, Harvard University; Dr. John Johnston, director of research, U. S. Steel Corporation, Kearny, New Jersey; Professor Charles A. Kraus, Brown University; Dr. David Wesson, consulting chemical engineer, Montclair, New Jersey.

OFFICERS of the American Pharmaceutical Association have been elected as follows: President, Robert L. Swain, Baltimore; First vice-president, Robert P. Fischelis, Trenton, New Jersey; Second vice-president, John C. Krantz, Jr., Baltimore; Members of the Council (for three years), W. D. Adams, Forney, Texas; H. V. Arny, New York, and H. C. Christensen, Chicago. The next annual meeting will be held

in the Hotel Loraine, Madison, Wisconsin, during the week of August 28 to September 2, 1933.

At the annual meeting of the New York Academy of Medicine Dr. Bernard Sachs was elected president and Dr. Fred P. Solley was elected vice-president.

Dr. HERMANN CHRIST, the botanist of Basle, recently celebrated his hundredth birthday.

Dr. G. Elliot Smith, professor of anatomy at University College, London, has been appointed Fullerian professor of physiology at the Royal Institution to succeed Professor J. B. S. Haldane, whose tenure of office expires in January.

PROFESSOR SIR EDWARD SHARPEY-SCHAFER has intimated to the Court of the University of Edinburgh his intention of retiring from the chair of physiology at the end of the current academic year.

At the ceremony of laying the cornerstone for the new library building at the University of Nancy, France, by the President of the Republic, the degree of docteur honoris causa was conferred on Professor Douglas Johnson, of Columbia University, in recognition of his contributions to geology and geography.

Dr. Wm. Charles White, chairman of the committee on Medical Research of the National Tuberculosis Association, has been elected an honorary member of the Tuberculosis Society of Scotland.

DE

Uni "Th

Vin

istry

medi

Colu

conf

Scho

and

of F

of t

fron

tion

of to Dec

tady

Gen

Elle

Col

Bog

sity

T

rep

ann

Gra

Lo

of live

aw

wh

tin

fire

pa Ur

Associates and other friends of Dr. Samuel A. Brown, dean emeritus of the New York University and Bellevue Hospital Medical College, entertained him at a dinner at the Union Club on December 4, in recognition of his many years of service. Dr. George David Stewart was toastmaster. The speakers included Charles M. Schwab; Dr. Elmer Ellsworth Brown, chancellor of New York University, and Dr. Walter L. Niles, formerly dean, Cornell University Medical College. Dr. Brown resigned as dean last May after sixteen years' service. He had been associated with the university since 1896.

A RECEPTION was recently given at Harvard University to Dr. Earnest A. Hooton, professor of anthropology, Peabody Museum; Dr. Hugh O'Neill Hencken, assistant curator of European archeology, Peabody Museum; Dr. William Lloyd Warner, assistant professor of social anthropology, and Hallam L. Movius, on the occasion of their return from an anthropological survey of the Irish Free State.

Professor Samuel N. Spring has been appointed dean of the New York State College of Forestry at Syracuse, and Clyde Leavitt acting assistant dean. Dean Spring, who has been assistant dean of the college, succeeds Dr. Hugh P. Baker, who is leaving on February 1 to assume the presidency of the Massachusetts State College at Amherst. Mr. Leavitt, who succeeds Dean Spring, has been acting director of forest research.

RALPH CHIPMAN HAWLEY, now professor of forestry in the School of Forestry of Yale University, has been appointed to the Morris K. Jesup professorship of silviculture, the chair previously held by the late Professor James W. Toumey. Mr. Hawley has been connected with the School of Forestry since 1907. Harold J. Lutz has been appointed assistant professor of forestry.

DR. CARL H. LENHART, professor of clinical surgery at Western Reserve University School of Medicine, has been appointed professor and head of the department of surgery to succeed Dr. Elliott C. Cutler. Dr. Lenhart will be director of surgery at the University Hospitals and in the outpatient departments of the school of medicine and the University Hospitals. Dr. Cutler became Moseley professor of surgery at Harvard University Medical School in succession to Dr. Harvey Cushing on the latter's recent retirement.

It is reported that Dr. E. S. Cowles, who was connected with the mental clinic at the Church of St. Mark's-in-the-Bouwerie, will become a member of the staff of the cancer clinic conducted by Dr. Joseph Colt Bloodgood at the Johns Hopkins University.

He will divide his time between Baltimore and New York.

Dr. Harvey J. Howard, professor of ophthalmology in the Washington University School of Medicine, St. Louis, recently resigned in order to enter private practice in his specialty in St. Louis. For a period of ten years prior to his going to St. Louis in 1927, Dr. Howard was head of the eye department for the Rockefeller Foundation in the Peiping Union Medical College.

Dr. Laurence H. Snyder, of the Ohio State University, has been elected editor-in-chief of The Ohio Journal of Science, succeeding Dr. Herbert Osborn.

DR. T. FRANKLIN SIBLY, vice-chancellor of the University of Reading, has been appointed a member of the Advisory Council to the Committee of the British Privy Council for Scientific and Industrial Research.

SIR GEORGE S. BUCHANAN, senior medical officer of the British Ministry of Health, has been appointed president of the Permanent Committee of the Office International d'Hygiène Publique, succeeding M. Otto Velghe, secretary-general of the Ministry of the Interior and of Hygiene at Brussels, who had held the position since 1919.

PROFESSOR M. ISHIMOTO has been appointed director of the Earthquake Research Institute, Tokyo, in succession to the late Professor K. Suyehiro.

Dr. E. C. Jeffrey, professor of plant morphology at Harvard University, has been granted leave of absence for the second half of the academic year.

DR. CHARLES J. CHAMBERLAIN, professor emeritus of morphology and cytology at the University of Chicago, on December 16 gave an illustrated lecture on "Cycads in the Field" to the University of Cincinnati Chapter of Sigma Xi.

DR. MARTIN H. FISCHER, of the College of Medicine of the University of Cincinnati, addressed the Western Reserve Chapter of Sigma Xi on December 7. His subject was "Fine Arts and the Chemist."

Dr. Hermann Ranke, professor of Egyptology at Heidelberg, gave on December 16, at the University of Wisconsin, an address on "Surgery in Ancient Egypt." This is the sixth annual address on the history of medicine under the William Snow Miller Lectureship, established in 1928 by the Phi Beta Pi Medical Fraternity.

THE second lecture to the faculty and students of the School of Medicine of the George Washington University on the Smith-Reed-Russell Society series was given on December 17 by Professor Edwin O. Jordan, of the department of hygiene and bacteriology of the of

University of Chicago. Dr. Jordan's subject was "The Common Cold and Influenza." The regular faculty seminar for December was given by Professor Vincent du Vigneaud, of the department of biochemistry, who spoke on "The Chemistry of Insulin."

DR. FRANKLIN M. HANGER, associate professor of medicine of the College of Physicians and Surgeons, Columbia University, gave a series of lectures and conferences from November 22 to December 17 at the School of Tropical Medicine, San Juan, Puerto Rico, and at the annual meeting of the Medical Association of Puerto Rico. The lectures were as follows. "The Recognition and Treatment of the Common Disorders of the Heart," "Diseases of the Liver and Spleen from the Medical Aspect" and "Problems of Infection."

The twenty-fifth anniversary of the Eastern Section of the American Chemical Society was celebrated on December 22 in the room at Union College, Schenectady, in which the chapter was initiated. Dr. Willis R. Whitney, who recently retired as director of the General Electric Research Laboratory; Dean Edward Ellery, head of the department of chemistry at Union College since 1904; Dr. William P. Mason, of the Rensselaer Polytechnic Institute, and Dr. Marston T. Bogert, professor of chemistry at Columbia University, were the principal speakers at the dinner.

THE Journal of the American Medical Association reports that the Southern Medical Association at its annual meeting in Birmingham on November 16, awarded its gold research medal to Dr. Evarts A. Graham, St. Louis, Bixby professor of surgery at the Washington University School of Medicine, St. Louis, for his work on the diagnosis and pathology of inflammatory diseases of the gallbladder and liver. This is the fourth time the medal has been awarded. The committee on scientific awards which recommended Dr. Graham consisted of three men who had previously received the same honor for distinguished investigation in medical subjects: Drs. Charles C. Bass, New Orleans; John Shelton Horsley, Richmond, Virginia, and Kenneth M. Lynch, Charleston, South Carolina. The association presented the first award among the scientific exhibits to Dr. Roy R. Kracke, associate professor of bacteriology and pathology and chairman of the department, Emory University School of Medicine, Atlanta, for an exhibit on the experimental production of leukocytosis; second award to Drs. William C. Langston and Paul L. Day, of the University of Arkansas School of Medicine, for their exhibit on cataract in vitamin G deficiency, and the third to Dr. Seale Harris, Birmingham, for a report of clinical studies on hyperinsulinism. Dr. James R. Garber, general chairman

of the Birmingham meeting, in appreciation of the twenty years' service of Mr. C. P. Loranz as secretary-manager of the association, presented him with a loving cup as a personal gift.

A JOINT resolution authorizing the President to invite the International Congress of Military Medicine and Pharmacy to hold its eighth congress in the United States in 1935 has passed the Senate and is now before the House of Representatives.

The sixth annual meeting of the Colorado-Wyoming Academy of Science was held on November 25 and 26 at the Colorado Agricultural College, Fort Collins. One hundred and thirty-one papers were presented. The general session was addressed by Professor A. S. Adams, of the Colorado School of Mines, on "A Defense of Mass Production." The meeting in 1933 will be held on December 1 and 2 at Laramie, Wyoming.

APPLICATIONS for the position of senior physical oceanographer must be on file with the U.S. Civil Service Commission at Washington, D. C., not later than January 17, 1933. The examination is to fill a vacancy in the U.S. Coast Guard Station at Woods Hole, Mass., and vacancies occurring in positions requiring similar qualifications, for duty in Washington, D. C., or in the field. The entrance salary is \$4,600 a year, less a furlough deduction of 8 1/3 per cent. The position is open only to men. Competitors will not be required to report for examination at any place, but will be rated on their education, training and experience. Applicants must have been graduated with a bachelor's degree from a college or university of recognized standing, upon completion of a course which included mathematics up to and through both differential and integral calculus and at least twenty-four semester hours in physics. In addition, they must have had at least five years of progressive professional experience in dynamic physical oceanography. Applications for the position of engineer in charge of helium purification plant must be on file with the U.S. Civil Service Commission not later than January 17, 1933. The examination is to fill a vacancy in the Naval Air Station, Sunnyvale, Mt. View, Calif., and vacancies occurring throughout the United States in positions requiring similar qualifications. The entrance salary is \$3,800 a year, less a furlough deduction of 8 1/3 per cent.

THE dedication of the new Louis Marshall Memorial Science Building at the New York State College of Forestry has been set for February 23.

THE construction of a new building at Wake Forest College School of Medicine, a gift to the school from the family of the late Dr. William Amos Johnson, was begun in November. The building will be in colonial style to harmonize with older buildings at the college, with two stories and a basement. The new structure, to be known as the Johnson Medical Building, will cost \$60,000.

DISCUSSION

DISSEMINATION OF SCIENTIFIC KNOWLEDGE

Some few hundred years ago all scientific knowledge was recorded and disseminated by means of books and by word of mouth. As scientific activity increased this method became inadequate, and scientific knowledge became recorded and disseminated largely in the form of journals. Lately science has become still more active and even this method has become somewhat inadequate. It seems too slow in many cases, and with the journals reaching an alarming number the literature becomes too voluminous for the average scientific man to cover. The printing of preliminary reports in weekly journals and the publishing of abstract journals has helped the situation somewhat. But even this is not adequate.

Many scientific men feel that further improvements should be made in our system of disseminating scientific knowledge. The first improvement suggested is to make scientific knowledge more up to date. The time which elapses between the completion of a scientific report and the appearance of the report in print is generally much too long.

The second improvement suggested is to provide some means whereby the scientific man can find and read with comparative ease all current scientific literature in either abstract or detailed form. Even within the narrow boundaries of the special sciences the literature is becoming so extensive that the average worker does not attempt to read it all, and partly for this reason shamelessly neglects most current foreign literature. All workers in a special field of science, as chemistry, for example, are not equally interested in a certain scientific paper. Scientific men may be divided into three groups, according to their degree of interest in a scientific paper The first group comprises those who are actually working on the problem with which the paper deals. These people want the information promptly and in great detail. In the second group are those who are interested to the extent of reading the full report but do not mind waiting for it to appear in a journal. In the third group are those who are only mildly interested and do not care to read the report in detail, but are quite satisfied to read a summary or abstract.

It is felt that the suggested improvements can best be realized by the publication of journals of previews in the various scientific fields. Each scientific man will write the previews for his own papers. The previews should be very short and contain all the essential information of the full reports. The previews are submitted to the journal of previews after the full reports have been accepted for publication by a standard journal. Within one month the previews should appear in print. This scheme should satisfy all the conditions outlined above. The workers of the first group will here find prompt information, and will no doubt communicate with the author for the details. The second group will get the same prompt information, and will know where the full report is to appear. The third group will read the previews and feel that they have obtained sufficient information.

Since a journal of previews can not limit itself to a certain number of pages a year but must take all papers it receives, it is somewhat difficult to fix the subscription rate. This difficulty can be overcome, perhaps, by fixing the subscription rate on the page basis rather than on the volume basis. This could be accomplished in two ways: the subscription could be made for a certain number of pages and payment made in advance as is customary; or, at the end of a year (or one half year) the publishers could bill the subscribers for the number of pages they had received.

The publication of a journal of bacteriological previews is actually under consideration. This article is published in the belief that scientific men in other fields have felt a similar need and might be interested in such a journal in their field. To be most useful the preview journal should be international in scope. It would help considerably to eliminate the woeful lack of cooperation and appreciation among the scientific men of the different countries.

EINAR LEIFSON

THE JOHNS HOPKINS UNIVERSITY

VIABILITY OF DROSOPHILA SPERMATOZOA IN SEA WATER

In the course of certain experiments on artificial fertilization of Drosophila eggs during the past summer at Woods Hole, data of general interest were accumulated regarding the viability of Drosophila spermatozoa under various environmental conditions. On beginning this work, it became obvious that the primary essential for mechanical transfer of sperm masses was a non-toxic fluid medium in which the sperm would remain alive for a sufficient length of

¹ Undulatory movement was arbitrarily taken as a criterion of life, though it is recognized that inactive sperm may be potentially capable of fertilizing eggs.

lical

fter

uld

ers

ion,

for

me

full

the

to

all

he

ne,

ge

time to complete the experiment. Attempts were first made to keep spermatozoa alive in the fluid expressed from the haematocoelic cavity, but these proved unsuccessful, as the fluid was small in quantity, exceedingly viscous and evaporated to a dry, brittle coagulum with great rapidity. When liberated into distilled or tap water, either combined with crushed-fly extract or alone, the sperm became inactive within a few min-

On turning to previous literature, it was found that this difficulty in keeping sperm alive had been noted by Nonidez in 1920.2 He prefaced his discussion of the internal phenomena of reproduction in Drosophila as follows:

An obstacle in the study of the experimental fertilization in Drosophila is the high sensitiveness of the spermatozoa to the action of fluids foreign to the body; they are easily injured and killed when placed in mixtures which do not exert noxious effects on the sperm of other animals, unless the spermatozoa are kept in such fluids for a long time. Although I tried repeatedly to eliminate this obstacle by the use of several so-called "indifferent" fluids, it was impossible to keep the spermatozoa active beyond a few minutes.

The fluids used by Nonidez were tap and distilled water, normal saline (0.5 per cent.), Ringer's solution (cold-blooded), 1 per cent. solution of potassium citrate, and a 1 per thousand solution of sodium hydroxide.

It occurred to the author that, since sea water is similar both in its salt constituents and salt balance to many of the body fluids in animals, it might serve as a satisfactory medium for Drosophila spermatozoa. The following series of experiments was, therefore, performed. The testes, vasa efferentia, vas deferens and paragonia of a four-day unmated D. melanogaster were dissected out in sea water diluted to various concentrations with distilled water. The vasa efferentia, distended with spermatozoa, were then ruptured with fine dissecting needles and the sperm mass drawn out. In a solution of 33 per cent. sea water, the sperm lying along the free surfaces of the sperm mass immediately exhibited extremely active undulatory motions. This activity continued with undiminished vigor for the first hour, gradually became less during the second and third hours, and, except for sporadic cases, had ceased at the end of six hours. The vas deferens pulsated rhythmically, and the paragonia also underwent museular contractions. No spermatozoa were seen to detach themselves from the sperm mass and swim off alone. The entire "tangle" clung together as if held in some slightly adhesive matrix. If manipulated too roughly with microneedles, the sperm soon became motionless. Sperm immersed in 50 per cent. sea

water showed greatly decreased activity in one to one and a half hours. In 75 per cent. and in 25 per cent. sea water sperm activity lessened in about thirty min-

RUTH B. HOWLAND

WASHINGTON SQUARE COLLEGE, NEW YORK UNIVERSITY

RIVER DEFLECTION: A CORRECTION

In the article on "Earth Rotation and River Erosion," in Science for November 11, a correction is necessary; and apology is due to Dr. Isaiah Bowman and Professor Mark Jefferson.

On page 424, second column, Mr. G. K. Gilbert was credited with the only critical analysis, in American literature, of the problem of river deflection. Instead of "only" the word "first" or "earliest" should have been used. In Volume 20 of this journal (1904, pages 273-277), Isaiah Bowman summarized his quantitative study of Mississippi River erosion, geographic work done while a student at Harvard under Professor W. M. Davis thirty years ago. Using thirteen sheets of the Mississippi River Commission covering a stretch of the river from Rosedale, Arkansas, to Bayou Goula Bend, Louisiana, he was able to measure the lateral shifting of the river in its erosional work during the years 1883-1896. Precise measurements of several elements in the changing curvatures of the stream are tabulated in the article. He recognized prevailing winds as an important dynamic factor in river cutting. Greater right-bank cutting was observed in meanders on the right (west) side where wind effects in the lee of the bank would be least and maxima of selective influences greatest on velocities developed under centrifugal force. He found lefthanded cutting most pronounced in bends and reaches, "as if the winds here overcame the effect of the earth's rotation."

Bowman also reported his examination of the streams on Long Island, stating that he did not find that most of them showed clear evidence of the greater right (west) bank erosion, which had been reported by previous observers.

Professor Jefferson, collaborating with Bowman, made refined measurements in bluff cutting along several rivers in eastern and one in southwestern Michigan. His preliminary paper is in this journal (Volume 19, 1904, pages 150-151), and his detailed evidence and conclusions in the Bulletin of the Geological Society of America (Volume 18, 1907, pages 333-350). The greater erosion that was found along the southern bluffs was thought to be attributable to the effect of regional tilting in postglacial time.

H. L. FAIRCHILD

UNIVERSITY OF ROCHESTER **DECEMBER 3, 1932**

² J. F. Nonidez, Biol. Bull., 39: 207-230, 1920.

QUOTATIONS

CONGRESS AND RESEARCH

"Insatiable curiosity... scientific research... wealth of new inventions and new products so satisfying to material needs of the people... certainty of endless and ever more rapid change as new knowledge is translated into new conveniences and comforts... the Government still does, and increasingly should, lead the way toward the discovery of new knowledge." These phrases with which President Hoover introduces in the January Scientific Monthly a series of articles on government research have a familiar ring. They will bear repetition in the hearing of a Congress that seems too bent on reducing expenditures at the expense of science.

In 1921 many commercial organizations stopped or curtailed research, only to rue their decision when, a few years later, new staffs had to be organized. In this far severer depression retrenchment has been felt less in the industrial laboratory than in the factory and salesroom. There may be less pioneering, but there are few signs that investigations which were begun in happier times have been abandoned. Yet the House is eliminating \$46,470 from fundamental research in geologic science and \$60,180 for the investigation of mineral resources in Alaska, to mention but two items. On this fundamental research the development of our mines and oil fields is directly dependent. How often must the story of new industries based on the utilization of waste be told or the riches that lie in a new principle?

There is no scientific lobby to drive home the implications of the President's language, particularly when he refers to government leadership in discovering new knowledge. The protests of the American Chemical Society, the mining industry, universities that have cooperated with government laboratories and a few isolated manufacturers have availed little. Government science must stand or fall on its own merits: It must, of course, economize with the rest. But one looks at the \$450,000,000 which, according to the National Economy League, could annually be saved if our war-pension policy were corrected, and sighs for Utopia. How trifling in comparison seem the few millions needed to carry on wealth-producing scientific work!—The New York Times.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

CONSTANT TEMPERATURE APPARATUS ADAPTED FOR USE ON THE MICROSCOPE STAGE

The apparatus described in the text and in Fig. 1 was used in maintaining constant temperature during microscopical observation on the rate of locomotion in Amoeba in various salt solutions. It has proven its practical worth to such an extent that several have been made for use in the course in general physiology in The Johns Hopkins University. The apparatus consists essentially of a brass jacket, through which a stream of water is circulated, the water bathing the bottom and the sides of a pyrex glass dish and maintaining the temperature of its contents constant. It is placed on the stage of the microscope, and transmitted light for observation is received through a glass window in the bottom.

It has the following advantages over the conventional Pfeiffer warming stage: it is not easily broken, the temperature of the solution in the dish is not appreciably influenced by rapid changes in room temperature, the dishes can be sealed to prevent exposure to air, and a series of dishes containing different solu-

tions can be prepared and rapidly inserted into and removed from the apparatus.

With 5 cc of solution in the dish and with the glass cover in place, observation of material in the dish can be made under a compound microscope with a 32 or 40 mm objective. With the cover removed, a 16 mm objective or a water immersion lens of any desired focal length can be used.

The apparatus is constructed of half hard brass, the top and bottom (10 cm square) of 1/16 in. stock, and the sides (1 in. high) of 3/64 in. strip brass. The joints are soldered and the glass inset in the bottom, through which light for microscopical observation is received, is sealed in with DeKhotinsky cement. The rubber diaphragm which grips the glass dish and prevents leakage of water is made from automobile tire inner tubing, the diameter of the hole in the center being slightly less than the diameter of the dish it receives. The dishes are made by cutting off the bottoms of 50 cc Pyrex beakers with a hot wire and grinding down the edges with emery powder. The temperature is maintained at any desired constant value by varying the rate of flow of hot or cold water through the apparatus. A small thermometer in a

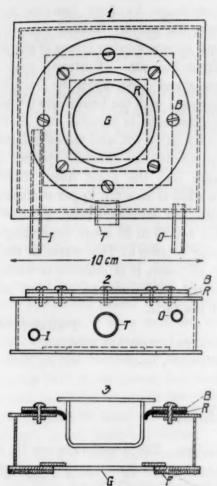


Fig. 1. Apparatus for maintaining a constant temperature during microscopical observation of living materials. B, brass washer; R, rubber diaphragm serving to grip the glass dish and prevent leakage of water; G, glass inset through which transmitted light is received; I, O, inlet and outlet tubes through which a stream of water of constant temperature is passed; T, tube to receive a small thermometer inserted in a rubber stopper; F, felt pad cemented to the bottom of the apparatus to prevent marring of the microscope stage and breakage of the glass inset; 1, top view of the apparatus; 2, end view; 3, diagrammatic section through the center with the glass dish and cover in place.

one hole rubber stopper inserted in the side of the apparatus and extending up to the edge of the dish serves to indicate the temperature. A thin layer of felt cemented to the bottom of the apparatus prevents marring of the microscope stage and minimizes the danger of breaking the glass inset.

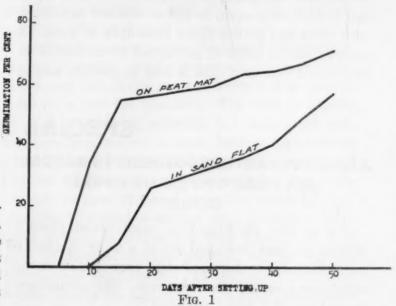
In the constant temperature apparatuses constructed for the course in general physiology, a circular coil of copper tubing has been inserted inside, so that the stream of water circulates through the coil instead of through the main chamber of the apparatus. A static volume of water is thus kept in the apparatus. The addition of the coil minimizes the tendency for the inlet and outlet sides of the dish to assume slightly different temperatures.

ROBERT F. PITTS

DEPARTMENT OF ZOOLOGY,
THE JOHNS HOPKINS UNIVERSITY

PEAT MATS FOR GERMINATION TESTS OF FOREST TREE SEEDS

A FORM of peat variously known as "peat moss," "acid peat" and "florists' peat" gives promise as a medium for testing the germination of seeds of various forest trees. At the Southern Forest Experiment Station of the U. S. Department of Agriculture, the peat has been compressed into mats or blocks with grooves on the upper surface to receive the seeds, and these mats have proved a valuable supplement to, and a possible substitute for, the cumbersome sand flats ordinarily used for germination tests of the seeds of southern pines. In the tests so far made, the peat mats have given more prompt results than the sand flats and, usually, higher final germination. Fig. 1



shows the course of germination of comparable samples of seed of *Pinus caribaea* on peat and in sand.

The mats occupy only one fifth or one sixth of the laboratory space required by sand flats, and their use does not involve introducing grit or sand among laboratory apparatus. In two parallel series of nine tests each, run for fifty days, the actual manipulative time of the series on peat mats, including final cutting tests, was only 85 per cent. of that required for the series in sand flats. Like sand flats, the peat mats are adapted to the testing of large seeds, for which Jacobsen germinators are not suitable. Adequate moisture is more readily maintained in the mats than in the sand flats. Seeds set to germinate on peat are less subject to mold than those set up on paper or cloth substrata.

The germination of many kinds of seeds is hastened and improved by stratifying the seeds in moist peat, at low temperatures, for a month or two before testing.¹ If the test is to be made in a sand flat, much

¹ Lela V. Barton, "Hastening the Germination of Southern Pine Seeds," Jour. Forest., 26 (6), 774-785. 5 fig. 1928.

time is consumed in picking the moist seeds out of the peat used in stratification, recounting them and sowing them in the flat. Use of the peat mat saves this time, since the mat is a suitable medium for stratification as well as for germination. The seeds are counted while still dry and easily handled, set up on the mat in position for the germination test, refrigerated for the desired period and removed to the germination room without further manipulation.

The peat mat used by the station is 19 by 19 cm square by 2 cm thick, and fits loosely into a square glass baking dish which is covered by a pane of ordinary window glass during the test. The mat is molded on a form consisting of ten triangular wooden strips, 17.7 cm long, 6 mm wide at the base and 4 mm from base to apex, tacked on a board parallel to each other and 1.6 cm apart from apex to apex. A square frame or collar of galvanized screen wire, 2 cm deep and 19 cm on a side, is held in position around

the block of strips by four headless nails driven vertically into the board. Around this wire frame a snugly fitting square wooden frame is slipped to keep the wire from bulging. Moistened peat is packed into the frame and down upon the triangular strips, and is compressed with the hands into a firm mat 2 cm deep. The apparatus is inverted, the board with the strips is gently lifted off, and the completed peat mat and its wire border are carefully pushed out of the square frame into the glass dish. The triangular strips leave what is now the upper surface of the mat marked with ten equally-spaced grooves or drills, each suitable for 25 to 50 seeds, depending on size.

By keeping a trace of free water in the bottom of the dish at all times, it is possible to maintain nearly ideal moisture conditions at the top of the mat throughout the tests.

PHILIP C. WAKELEY

w th or no w T ref fa Y vi

ai (a

fi vi ce T M m da th N an ir

h V a: sj w

U. S. DEPARTMENT OF AGRICULTURE, NEW ORLEANS, LA.

SPECIAL ARTICLES

APPARENT PARTHENOGENESIS IN NATURE, IN A FORM OF FISH OF HYBRID ORIGIN

We are now clinching with experimental proof a number of ideas developed out of a study in systematic ichthyology. As these ideas express phenomena which are new for the vertebrates, this preliminary announcement is being published.

Through northeastern Mexico and the southern tip of Texas there occurs in abundance a form of viviparous cyprinodont, of the family Poeciliidae, which has been thought to be a distinct species, Mollienisia formosa. From circumstantial evidence we concluded that this form was probably the hybrid between Mollienisia latipinna and Mollienisia sphenops, species so distinct that they were long placed in different genera. This form was found to be exactly intermediate between those species in all distinctive features-depth of body, strength of rows of spots, position and size of dorsal fin and number of dorsal fin rays. These characters are all closely correlated and may be briefly illustrated by the usual number of dorsal rays: 9 in sphenops, 11 in "formosa" and 13 in the local race of latipinna.

Mollienisia "formosa" varies somewhat geographically, but in each region it is intermediate between the particular local forms of sphenops and latipinna which occur there. Recently we have received an apparent hybrid from the Yucatan Peninsula, exactly intermediate between the local race of M. sphenops

and M. velifera. The dorsal rays are 13, midway between the approximate average for the local sphenops (9.5) and for velifera (17.5).

In the laboratory, a culture of males and females of this supposed hybrid stock, obtained by Dr. Myron Gordon in Rio Papaloapan, Vera Cruz, Mexico, has shown various reproductive abnormalities. Although several of the females apparently have become pregnant, only one of them in our aquaria has delivered young, two in one brood and one in the next brood (a female Mollienisia of this size should produce 10 to 60 young in a brood). No such lack of fecundity is apparent in the initial cross producing the hybrids, nor in the back crosses with the parent species. Most of the apparently pregnant females reverted to a thin condition, as though resorbing young. A rather high percentage of the young are abnormal, and most or all of the abnormal ones are developing into males. An unusually high percentage of the adult males develop irregular black blotches.

The hypothesis that Mollienisia "formosa" is the hybrid of M. latipinna by M. sphenops has just been verified by an aquarium mating of a male sphenops and a virgin female latipinna. The 22 young produced are clearly hybrids. We also have apparently pregnant females from the reciprocal species-cross.

This verified hybrid exists in nature in great abundance. Many hundreds of specimens have been collected. It has almost every characteristic of a species: a definite, homogeneous range; clear consistency of characters, and, as shown below, the ability to repro-

n

d

n

le

ıt

duce in approximate genetic constancy. This constitutes the nearest approach known to us of a demonstration that hybridization plays a rôle in the process of speciation of animals.

The outstanding peculiarity in the natural relations of this hybrid form is that it exists over much of its range only as females. Not a single male has been found, among about two thousand specimens examined, from Tamaulipas and Texas. Such a condition obtains among invertebrates, but has not previously been encountered among the vertebrates.

The only male hybrids we have seen from nature are those from the Rio Papaloapan, where or near where both parent species occur together. Where this hybrid form exists in nature solely as females, it occurs with only one of the parent species; never with neither. In Tamaulipas it lives with *M. sphenops*, well inland from the coastwise range of latipinna. In Texas it abounds in the resacas of the Brownsville region, in company with *M. latipinna*, but considerably farther north than sphenops occurs in the coastal area. Yet the female hybrids of these two regions appear virtually identical, in all their characters. For example, they both usually have 11 dorsal rays.

Our natural supposition was that these female hybrids can mate only with *sphenops* males in the Tamaulipas streams, and only with *latipinna* males in Texas. Since the males thus assumed to be utilized are very different, while the offspring are entirely alike (and all females) in the two areas, some genetic process very peculiar for a vertebrate must be involved.

This supposition has been completely verified in our aquaria. A number of females of M. "formosa," from Forlon in Tamaulipas and from near Brownsville in Texas have produced young after being received from nature. Although the females from Tamaulipas had almost certainly mated with males of M. sphenops, while those from Texas had mated with males of the very different M. latipinna, they have to date produced several hundred young, showing throughout a marked uniformity in characters. Neither lot of young (many already adult) shows any apparent approach toward the characters of the male involved. The characters of the female parent have been inherited as a block. Although the broods have been large and many, not a single male has appeared among them. This result is wholly consistent with and explanatory of the occurrence of females only in nature, in the regions from which the two stocks came.

That we are dealing with entirely matroclinous inheritance has been proved by controlled matings. Virgin female hybrids, which have never been with any males, mate readily with males of either parent species, and soon become pregnant. At the time of writing, two such hybrid females of the Texas stock,

mated with males of M. latipinna, have already given birth to purely matroclinous young.

The consistent and abundant production of purely matroclinous and constantly female offspring by this hybrid form of fish finds its most plausible explanation as parthenogenesis. It is apparently not a spontaneous parthenogenesis, since many controls, unmated, have shown no indication of becoming pregnant. We provisionally assume that we are probably dealing with a case of gynogenesis (parthenogenetic development initiated by sperm which for some reason is prevented from taking part in heredity)¹—a condition recorded as naturally occurring among certain invertebrates, but not among vertebrates. This hypothesis does not exclude alternatives, and requires cytological verification. Plans have been made for this cytological investigation.

The breeding experiments with these fishes are being rapidly expanded, and further results are anticipated in the near future (as many as three or four generations in a year are possible). The matings already productive are being repeated, and many other matings have been and will be made, between the numerous stocks we have from localities between Mississippi and Panama. Inbreeding and back-crossing of the young hybrids we have produced in wholly controlled matings will of course be carried out. Attempts will be made by both individual and mass matings, starting with the assumed original material, to fully recreate the uniquely characterized and peculiarly distributed hybrid form under discussion. The anticipated results of breeding both natural and aquarium-reared male hybrids to female hybrids known to be virgin, and to females of both the parent species, will be vital to the analysis of the origin and distribution of this form with such surprising reproductive behavior.

These viviparous poeciliid fishes, not only of Mollienisia but also of other genera, furnish prime material for studies in experimental evolution. The researches by Winge, Gordon and others have already shown how valuable this material is in the interpretation of the gene and chromosome basis for the development of characters and for the production of sex. A genetic explanation for the production of wholly female and purely matroclinous young by the hybrids in Mollienisia may contribute critical data for the solution of these problems.

In conclusion, the conditions demonstrated by this study, so far as we know novel in the biology of the

¹ Wilson excludes gynogenesis from the limits of parthenogenesis, but his classification of reproductive methods on the basis of differences in the manner of egg activation seems less logical and less significant than one based on the genetic constitution of the offspring. Parthenogenesis we regard as unisexual reproduction, as the result of which the offspring are genetically like the mother.

vertebrates, are: (1) The abundant occurrence in nature of a form of demonstrated hybrid origin, having nearly all of the characteristics of a natural species; (2) the occurrence of a form as females only, over a wide portion of its range; (3) the consistent and abundant production of wholly female and purely matroclinous young; (4) apparent parthenogenesis in nature.

CARL L. HUBBS
LAURA C. HUBBS

MUSEUM OF ZOOLOGY, UNIVERSITY OF MICHIGAN

THE VITAMIN C ACTIVITY OF HEXURONIC ACID FROM SUPRARENAL GLANDS¹

THE isolation and identification of vitamin C (from lemons), first reported by the writers,2,3 has been followed by independent and in part concurrent evidence from other laboratories,4,5,6,7,8 which adds support to our conclusion that vitamin C is identical with the hexuronic acid previously studied as a reducing agent by Szent-Gyorgyi9 and Kendall.10 The earlier papers from other laboratories did not include quantitative assays of the acid prepared from suprarenal glands. Only one feeding level (1 mg per day) was recorded, so that the minimum protective dosage was not evident, and from this point of view there was need of further evidence to answer Zilva's criticism.11 This point was further emphasized by an indication that the original crystals from animal glands could be further purified,12 even though they were of reasonable purity when tested. Reasoning from analogy between the vitamin C content of lemon juice and its hexuronic acid content is conditioned by a variation of over 100 per cent. in the antiscorbutic activity of the juice and by very little data regarding its hexuronic acid content. The paper by Harris and others13 included an assay using a different technique than ours, but their product was evidently about the same as our own in activity. It

1 Contribution No. 256 from the Department of Chem-

istry, University of Pittsburgh.

² C. G. King and W. A. Waugh, Science, 75: 357, 1932.

³ W. A. Waugh and C. G. King, J. Biol. Chem., 97: 325, 1932.

⁴ J. L. Svirbely and A. Szent-Gyorgyi, Nature, 129: 576, 1932; Biochem. Jour., 26: 865, 1932.

S. S. Zilva, Nature, 129; 943, 1932; ibid., p. 69.
 L. J. Harris, I. Mills and J. R. M. Innes, Lancet,
 July 3, 1932, p. 235.

July 3, 1932, p. 235.

7 J. Tillmans and P. Hirsch, Biochem. Z., 250: 312, 1932; Z. Untersuch. Lebensm., 63: 1, 1932.

⁸ E. K. Nelson, Science, 76: 345, 1932.

9 A. Szent-Gyorgyi, Biochem. Jour., 22: 1387, 1928.

10 E. C. Kendall, Proc. Staff Meetings Mayo Clinic, 6: 296, 1931.

11 S. S. Zilva, loc. cit.

¹² R. W. Herbert, E. L. Hirst and E. S. Cox, *Nature*, 130: 205, 1932.

13 L. J. Harris and others, loc. cit.

is clearly evident from his later publications¹⁴ that Szent-Gyorgyi had no knowledge of the vitamin function of the acid previous to the experimental work published in 1932.

To provide further evidence that the crystalline vitamin was not a case of inactive crystals accompanied by active material, we have made an assay of the hexuronic acid prepared by Dr. E. C. Kendallus from suprarenal glands. This product was prepared according to a distinctively different procedure from that used in our laboratory and from a different type of starting material. Hence a quantitative study of its activity provided strong evidence regarding the identity of the vitamin. This product corresponded with our own in crystalline form, melting point, reducing value, titration equivalent and rotatory power. The essay showed strikingly that the two preparations were identical in activity within the limits of measurement. A dosage of 0.5 mg daily provided a minimum protective level with slightly suppressed growth (133) g. gain in 55 days) and with two of five animals showing slight scurvy symptoms (av. score 2). The 0.75 mg level was above the amount required for protection, and the 0.25 mg level was distinctly too low.

The procedure for isolating the hexuronic acid from suprarenal glands involved an ether extraction of the solution when neutralized by sodium bicarbonate. This would have removed such a substance as the o-diphenol derivatives of narcotine, which has been considered by Rygh¹⁶ to be identical with vitamin C.

W. A. WAUGH C. G. KING

BOOKS RECEIVED

Adrian, E. D. The Mechanism of Nervous Action. Pp. x + 103.

Medical Care for the American People: The Final Report of the Committee on the Costs of Medical Care. Pp. xvi + 213. University of Chicago Press. \$1.50.

Rivadavia, Bernardino, Editor. Anales del Museo Nacional de Historia Natural. Tomo XXXV. Pp. xi+341. Illustrated. Museo, Buenos Aires.

SMITH, JAMES L. Growth. Pp. vii + 135. Oliver &

Boyd, Edinburgh. 6/.

South African Journal of Science: The Report of the South African Association for the Advancement of Science. 1932, Durban. Vol. XXIX. Pp. lii+866.

The Association, Johannesburg. 30/.

The Association, Johannesburg. 30/.
SPENCE, HUGH S. Feldspar. Pp. vii + 145. Illustrated.
Department of Mines, Canada. \$.25.

STENSIÖ, ERIK A. The Cephalaspids of Great Britain.

Pp. xiv + 220. 66 plates. 70 figures. British Museum (Natural History). £3.

Sudan Notes and Records. Vol. XV, 1932. Part II.
Pp. 159-280. 16 plates. Sudan Notes and Records,
Khartoum.

14 A. Szent-Gyorgyi, Science, 72: 125, 1930; Jour.

Biol. Chem., 90: 385, 1931.

15 An amount of the crystalline acid sufficient for the above assay was kindly furnished by Dr. E. C. Kendall,

Mayo Foundation, Rochester, Minnesota.

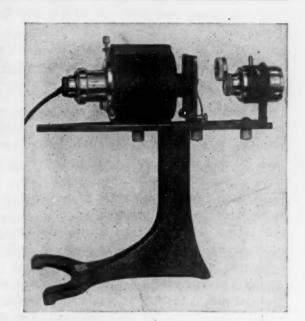
16 O. Rygh, A. Rygh and P. LaLand, Physiol. Chem., 204: 105, 1932; O. Rygh and A. Rygh, ibid., 211: 275.

1932.

A Time Saving Teaching Tool

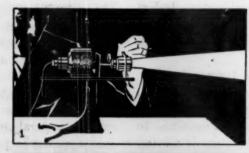
THE B<RIPLE-PURPOSE

MICRO-PROJECTOR

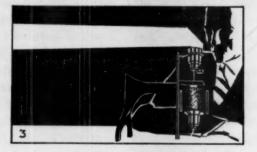


THIS ingeniously designed instrument should be in every science classroom for it does the work of three instruments and allows the teacher to demonstrate more quickly and with better results.

The B&L Triple-Purpose Micro-Projector projects at distances from 4 to 15 feet (1) permanently mounted specimens for group instruction; (2) living specimens mounted in liquid; (3) also projects images on paper for student's and teacher's note book drawings. The







The above illustration shows the triple-purpose microprojector in classroom use. 1. Projecting permanently mounted specimens for group instruction. 2. Projecting images on paper for students' and teacher's note book drawings. 3. Projecting living specimens mounted in liquid. excellence of the projected images is due to the inherently fine quality of the optics and to the careful design.

The outfit is light $(5\frac{1}{4}$ lbs.), strong, easily portable, and every part and performance meets the standards of *precision and quality* always associated with B&L Products.

The low price \$43.50 (for 110 volt A.C.) makes this instrument a necessity even for institutions with reduced budgets (\$46.50 for 110 volt A.C. or D.C.). Subject to educational discount. Send the coupon today!



BAUSCH	& LOMB	OPTICAL	COMPANY
642 St. Paul	Street	Re	ochester, N. Y.

Please send me complete details of the new Triple-Purpose Micro-Projector.

Name.

Address

City.

.State.

SCIENCE NEWS

Science Service, Washington, D. C.

A FAMILY OF ASTRONOMERS

When, at the end of this month, Dr. Otto Struve, thirty-four-year-old University of Chicago astronomer, assumes the directorship of the Yerkes Observatory at Williams Bay, succeeding Dr. Edwin B. Frost, who has been director since 1905, he will be following in the footsteps of his ancestors for three generations. His father, uncle, grandfather and great-grandfather all achieved fame in astronomical research.

Friedrich Georg Wilhelm Struve was born at Altona, in Germany, in 1793, but he went to Russia and was appointed director of the newly organized observatory at the University of Dorpat when he was only twenty years of age. In 1839 he was made director of the Imperial Observatory at Pulkowa, and died in 1864 at St. Petersburg, as it was then called. He was especially noted for his pioneer observations of double stars, bodies which are apparently single, but which are shown by the telescope to consist of two bodies revolving around each other.

His son, Otto Wilhelm, was born at Dorpat in 1819. At an early age he was appointed his father's assistant, and continued the work in double stars. When only twenty-two he made a famous series of researches to determine the direction that the solar system is moving through space. He also is known for his important work in stellar distance determination, and in the study of the nebulae, clouds of glowing gas, that are scattered among the stars. In 1861 his father retired, and he became director of the observatory at Pulkowa. He made two visits to the United States, the first in 1879, to place the order with Alvan Clark, of Massachusetts, for a thirtyinch telescope lens, then the largest in the world. In 1883 he came again to test the lens, and it was mounted in Russia the following year. He retired from his directorship in 1890, and went to live in Germany, until his death in 1905.

Otto Wilhelm Struve had two sons, both born in Russia. The first was Karl Hermann, born in 1854, who also later went to Germany. There he finally became director of the observatory of the University of Berlin. His son, Georg Struve, is now at the University of Berlin's observatory at Berlin-Babelsberg. Otto's other son, Gustav Wilhelm Ludwig, was born in 1858, and in 1886 became an observer at the Dorpat Observatory. In 1894 he went to Kharkov, in Southern Russia, to join the faculty of the university as director of the observatory and later as dean of the faculty.

His son is the present Otto, who was born in Russia, at Kharkov, on August 12, 1897. He studied at the University of Kharkov, and took a diploma in 1919, during which year he was also junior instructor. From 1917 to 1920 he served as a lieutenant in the Imperial Russian army, and later in the White Russian army. In 1921 he came to the United States, and became an assistant in stellar spectroscopy at the University of

Chicago, receiving the degree of Ph.D. in 1923. The following year he joined the staff of the Yerkes Observatory, first as instructor, later becoming professor and, in 1931, assistant director. He is known especially for his studies with the aid of the spectroscope, and of the motions of stars towards or away from the earth, determined by the shift of the lines in their spectrum. He has also worked with asteroids, the tiny planets, and with the family specialty, double stars.

COMETS FROM ERUPTIONS OF JUPITER

Many of the comets that appear in the night sky to the telescopes of astronomers may really be the product of eruptions from the surface of the planet Jupiter within the last few centuries, if the theory just proposed by S. Vsessviatsky is correct. In a communication to The Observatory, British astronomical journal, Dr. Vsessviatsky, who is connected with the Astronomical Institute of Moscow, renews this suggestion, which was originally made a number of years ago by Richard Proctor, a famous English astronomer.

The "capture theory," held by many astronomers, supposes that these comets originally came into the solar system in parabolic orbits from vast distances. When one happened to pass close to Jupiter, that planet, with its great mass, pulled it out of its former path by gravitational attraction. After that the comet moved in an elliptical path, between the region of the sun and the orbit of Jupiter. Dr. Vsessviatsky points out that if this were the case it would be very rarely that a comet entering the solar system would happen to pass close enough to Jupiter to be pulled into the elliptical orbit. He estimates that it would only happen to something like one in 100,000 comets, but actually, he declares, there are about sixteen of these short-period comets to a hundred parabolic ones. Also, he says, the diminution in brightness of the short-period comets indicates that their age is a matter of only a few centuries.

"The conclusion follows," writes Dr. Vsessviatsky, "that the date of birth of a short-period comet does not precede by very long the date of its discovery, whereas captures by the giant planets would occur only at very long intervals." He also points out that all of these comets are moving around the sun in the same direction as Jupiter, and the other planets, whereas if they were captured some would probably be moving in the other direction, or "retrograde." The connection between these comets and Jupiter can be fully explained by the hypothesis that they are the product of eruptions taking place on Jupiter's surface.

Besides the family of comets related to Jupiter, there are others apparently connected with Saturn, and possibly with Uranus and Neptune. The theory suggests that very active processes are in progress on the surface of the large planets, resulting in the frequent expulsion of matter.

VITAMIN G

VITAMIN G is now known to consist of two factors, tentatively called X and Y, which are as necessary to each other to produce the vitamin G effect as Siamese twins are to each other. This discovery was made by Professor H. C. Sherman, of Columbia University, and Miss Hazel Stiebeling, then of Columbia but now at the U. S. Bureau of Home Economics.

Vitamin G is the anti-pellagra vitamin, that prevents the development of the disease of malnutrition that has often been prevalent in the South among poor whites and Negroes whose diet consists largely of corn pone, molasses and "fat back" pork. It was identified by the late Dr. Goldberger, of the U. S. Public Health Service, and called by him the P-P or pellagra-preventive factor. The British have named it the B2 vitamin because it once was considered a part of vitamin B.

The Columbia University investigators split the G vitamin into two chemical parts. They set feasts before rats that had varying amounts of these X and Y factors. They watched them and weighed them to see how they grew. It was found that X and Y are both necessary. Double doses of Y without any X caused the growth curve to flatten out slowly, showing that lack of X prevented proper growth after the rats had eaten the food for some time. If two doses of Y were placed in the ration without any X factor, the rats did not attain proper growth from the very beginning.

Since rats and men are affected by vitamins with great similarity, Professor Sherman feels confident that children and adults need both the X and Y parts of vitamin G just as much as rats. Vitamin G is known to occur in milk, meat, yeast and other foods.

THE EFFECTS OF X-RAYS ON CANCER CELLS

WHEN x-rays are used to treat cancer, the cells of the cancer are not killed directly but are made to live more quickly, finish their normal life more rapidly and die of senility at an earlier age.

This answer to the hitherto unsolved problem of what happens when a cancer victim is irradiated and the cancer decreases in size was given to the American Association for the Advancement of Science meeting at Syracuse by Dr. Raphael Isaacs, of the University of Michigan, who made observations on 923 patients before he announced his findings.

It is expected that this discovery will be of great importance in understanding various kinds of cancer and other diseases of cell growth, such as leukemia, lymphoblastoma and pernicious and other anemias.

Treatment of cancer by x-rays results in a premature old age, Dr. Isaacs found. The premature old age occurs not in the patient but in the cells of the malignant growth with which he is afflicted. This is a case where premature senility is welcome.

Dr. Isaacs studied the various kinds of the blood cells and noted the effect of the x-ray treatments given the patients. Even after x-ray therapy, the blood-forming cells, both white and red, go through their lives in an orderly manner and die normal deaths.

"Nothing happens to the cells that would not have happened to them if they had lived their normal life," said Dr. Isaacs, "except that x-rays make them go through the process somewhat faster. X-rays act by hurrying the onset of old age and not by killing directly."

Radiologists have noted that there is a lag between the time of the x-ray treatment and the effect that is produced. Dr. Isaacs said that it corresponds to the time it takes the irradiated cells to live and die, in an accelerated but normal manner. Some cells, like germ cells and white blood cells, die fairly quickly after treatment with x-rays. Dr. Isaacs finds that these cells have a short adult life and therefore die soon after it is reached. Other cells, like those of muscle, nerve and fibrous tissue cells, live long after they become adults and when stimulated to develop to maturity by x-rays, they do not die of senility for a long time. The effects of the x-ray treatment are therefore delayed longer.

A favorite explanation of the action of x-rays and radium on the cancer and other cells has been that they killed the cells, but the researches reported by Dr. Isaacs repudiate this theory.

THE CAUSES OF TOOTH DECAY

EVIDENCE supporting the theory that acid-producing germs cause tooth decay was presented by Dr. H. E. Friesell, dean of the University of Pittsburgh School of Dentistry, and Dr. J. J. Enright, of the Mellon Institute, at a special symposium on dental decay held at Pittsburgh on June 19, under the auspices of the Pittsburgh section of the International Association for Dental Research.

Diet is of greatest importance while the teeth are being formed and before they are erupted, and the expectant mother and the small child should have plenty of fresh fruits, vegetables, dairy products and preparations or foods containing vitamins A and D. However, after the teeth are erupted, the conditions in the mouth and particularly the presence of acid and acid-forming bacilli are responsible for dental decay, in their opinion.

Drs. Friesell and Enright studied the effect of acid on extracted teeth and found that it produced decay which could not be distinguished from that occurring naturally. They even examined under a microscope thin ground sections of several hundred specimens of such artificially produced decay. They found that unless the acid strength was greater than that of sour milk, the acid would not produce decay under conditions like those found in the mouth.

Twenty-three varieties of bacteria found in mouths were also studied. Of these only one, the lactobacillus, could stand acid strong enough to produce decay of the teeth. This bacillus itself forms acid from starches and sugars, such as may be in food particles clinging to the teeth. A survey showed that in general progressive decay of the enamel of the teeth was accompanied by the presence of these bacilli in the dental zone and absence of decay was accompanied by absence of massive infection with these same lactobacilli. A careful clinical study at the University of Pittsburgh further showed

that measures which would reduce by two thirds the infection of the dental zone with these lactobacilli also decreased the amount of new tooth decay developing in a year.

THE BOTANICAL GARDEN AT JERUSALEM

CEDARS of Lebanon, oaks of the same species as the mighty tree called "Abraham's oak" and many other species of trees are to grow in the new botanical garden of the Hebrew University in Jerusalem which was dedicated recently. They are to play a part in an ambitious program sponsored by the university, aiming at the reestablishment of forests in Palestine, long a nearly treeless land, due to centuries of poverty, misgovernment and war.

Besides the trees, there will be an abundance of smaller plants, many of them famous in Biblical literature: "the hyssop that groweth in the wall," "lilies of the field," the mustard "tree" that grows from "the least of seeds." The aim of Dr. A. Eig is to assemble in this garden as complete a collection as possible of all the floras of Near Eastern countries, from Iraq to Sinai, and out into the deserts beyond the Jordan. It is necessary to act quickly in some localities, for the Western methods of cultivation introduced by the new colonists are destroying many species spared by the "scratchy" agriculture of the Arabs, and the necessary draining of malaria marshes is depriving other native plants of their old rootholds. To save some of these, as well as to increase knowledge regarding plants not yet in danger, is the working program.

The garden occupies the summit and part of the slopes of Mount Scopus, a high hill whence Roman conquerors once looked on the city they had beaten down. For all its historic associations, however, Mount Scopus is not an ideal spot for a botanical garden, for like most of the hill land in Palestine it is thin-soiled and lacks water. These considerations helped to determine Dr. Eig's decision to plant the resistant native plants first, and let the costlier, more exacting foreign species wait until more funds are available for their care.

One section of the garden is to be left with its native vegetation untouched, to see whether some of the stunted trees of the "maqui" will not develop into useful specimens if left for some years unpersecuted by necessitous peasants who dig up even insignificant shrubs for fuel. "Maqui" is the vegetation natural to a considerable part of Palestine and the Near East; it is a tangled mass of mixed shrubs very much like the "chaparral" of the American Southwest.

Reminiscent, too, of the American Southwest is one tree that is proving a great success in Palestine—the eucalyptus. This tree from the Antipodes has become so usual a landmark of the new settlements of Zionists that the Arabs call it "Sejeret el Jahud," which means "the Jewish tree."

The new garden will be known as the Lamport Botanical Garden. The land was donated to the Hebrew University by Solomon Lamport, of New York City, in memory of his young son, Montague.

ITEMS

THE large sun-spot that crossed the center of the sun on May 26 has returned and brought with it another almost as large, besides a group of smaller ones. Either of the two spots is big enough to engulf the earth with room to spare. The main one has changed little, being 23,000 miles across and four degrees north of the solar equator. It measured 22,000 miles on May 27. The group reached the center of the sun on June 22 and may be visible to a keen observer with the aid of a piece of smoked glass. It measures 101,000 miles across, about half the distance between the earth and the moon. The sun rotates with a period of approximately 27 days and in some cases a sun-spot persists for one or more revolutions.

DISCOVERY of light in new stars that flash out in the heavens that is like the aurora borealis was announced by Dr. Paul W. Merrill, of the Mount Wilson Observatory, Pasadena, who spoke at Syracuse as chairman of the astronomical section of the American Association for the Advancement of Science. A characteristic green line found in the spectrum of earthly northern lights was found by Mount Wilson astronomers in light from several novae, as the mysterious stars that suddenly increase in brilliance are called. This is the first time that the green line has been discovered outside the atmosphere of the earth. Dr. Merrill concluded that the gases surrounding the new stars are at higher pressures than those in the gas clouds or gaseous nebulae of the sky, but at lower pressures than the upper atmosphere of the earth, where polar lights are born.

MAINE and Montana have been added to the list of states which have attained the standards for accurate reporting of communicable diseases set by the U.S. Public Health Service, Dr. R. C. Williams, of the Public Health Service, told the Conference of State and Territorial Health Officers in Washington. The states reaching this standard now number twenty-six. Public Health Service has computed the number of cases of a disease which occur, on the average, for every death from that disease. States which report this average number or more, for every death from the disease in the state, are considered as having reached the standard in disease reporting. Eleven cases of diphtheria, for example, occur for every diphtheria death, on the average. If there are five deaths from diphtheria reported in Maine for one month there should be 55 cases reported. They have computed similar ratios for measles, scarlet fever, typhoid fever and whooping cough.

A HIGH-SPEED passenger car with self-contained motive power will soon be placed in service between Berlin and Hamburg. Speeds of over 93 miles an hour will be sustained. The new motorized car, which is over 137 feet long, will be rounded at each end to reduce wind resistance. Its design was determined after wind tunnel tests at the Friedrichshafen Zeppelin works. Regular trains on the same run will have their speed increased to over 70 miles an hour.



The Package Reflects the Product

WHATMAN Filter Papers are all packed in boxes at the mill to exclude dirt and dust and to provide a handy storage receptacle in the laboratory.

In addition, the acid washed grades are wrapped in transparent material to exclude fumes and reduce the chances of contamination to a minimum.

WHATMAN Filter Papers are worthy of this extra added protection. They are manufactured under chemical control in a variety of grades to rigid specifications that assure the adaptability of each grade to specific analyses.

Leading Laboratories in all lines of industry have standardized on WHATMAN Filter Papers because they are uniformly dependable, immediately available, carefully packed and modestly priced.

Standardize your Laboratory on WHATMAN and forget about Filter Papers

Samples await your request.

H. REEVE ANGEL & CO. INC. 7-11 Spruce St., New York, N. Y.

BOSTON UNIVERSITY SCHOOL OF MEDICINE

ORGANIZED IN 1873

ANNOUNCEMENT

may be obtained by application to

THE REGISTRAR

80 East Concord Street

Boston

Massachusetts

PRECISION BINOCULARS

Made with the accuracy of fine scientific instruments. Ample range of magnifications, bright clear field; compactness; freedom from color aberration.

For Information write

BAUSCH & LOMB OPTICAL CO. 632 St. Paul St., Rochester, N. Y.

A Hoke Micrometric Control

is handy for bubbling gases through solutions.

Ask for folder SM

Hoke Incorporated 22 Albany St., New York City



Southern Biological Supply Co., Inc.



Living and Preserved Biological Specimens of all Types for the Laboratory Museum or Research, especially Southern or Louisiana Forms.

Specialists in Amoeba Cultures, Giant Bullfrogs, Alligators, etc.

517 Decatur St.,

New Orleans, La.



Field Equipment for Engineers,
Explorers, Hunters, Travelers
Scientific Instruments, Packing Equipment,
Skis, Firearms, Clothing, Fiala Pat. Sleeping Bags, Optical Instruments, Astronomic
Telescopes, Range Finders, Binoculars.
Paulin Altimeters. Write for Catalog "A"

FIALA OUTFITS

47 Warren St., New York

JU

I

tig

on

7

less

mil

pol

eip

er;

su

ra

th

ot

uı

n

p

e

ci

n

SCIENCE NEWS

Science Service, Washington, D. C.

EFFECT OF THE GOVERNMENT ECONOMY MEASURE ON SCIENTIFIC EXPERTS

PALEMON H. DORSETT, veteran plant explorer for the U. S. Department of Agriculture, is one of the men whose expert services are lost to the government through the provision of the economy bill calling for compulsory retirement of those who have reached retirement age. Another outstanding scientist who must give up his vital research is Dr. H. H. Kimball, of the U. S. Weather Bureau. Dr. Kimball is an expert on atmospheric circulation, radiation from sun and sky and other phases of meteorology.

Among other important men lost from the scientific staff of the U. S. Department of Agriculture through forced retirement are: Senior Agriculturist Isaac W. Hill; Senior Agriculturist Henry C. Henricksen; Dr. Oliver L. Fassig, chief of the division of climatology at the Weather Bureau; Dr. Albert Hassel, senior zoologist in the Bureau of Animal Industry; Dr. Robert A. Ramsay, chief of the tick eradication division in the Bureau of Animal Industry, and many other forecasters and veterinarians—fifty-one in the professional service of the department.

The U.S. National Museum loses Barton A. Bean who has made a special study of the fishes of the Atlantic coast especially of Florida and the Bahamas.

The Bureau of Mines loses an assistant economic analyst, Jefferson Littleton, Marius R. Campbell, a geologist with special knowledge of coal testing and valuation, leaves the Geological Survey, as do also Dr. Edward O. Ulrich, geologist and paleontologist, and Frank C. Schrader, specialist on the physiography and mineral resources of Alaska and the western United States.

Three other men from the Geological Survey have been retained for one month by executive order of the president so that he might have a longer time in which to consider whether they should be kept in the service. These are the chief geologist, T. W. Stanton; John M. Nickles and S. J. Kubel.

A few of the scientists affected by this provision of the economy bill have been kept in their places by special order of the president. These include Professor Charles F. Marvin, chief of the Weather Bureau, and Dr. William J. Humphreys, and Dr. Isaac M. Cline of his staff. The Smithsonian Institution retains Dr. Walter Hough, Dr. Leonhard Stejneger, William H. Blackburne, head keeper at the National Zoological Park, and J. N. B. Hewitt. The Geological Survey keeps Dr. David White.

AVIATION RESEARCH

THE National Advisory Committee for Aeronautics will proceed with their scientific research in 1933 with no extraordinary curtailment of funds. Receiving something over one million dollars for such work in 1932, their budget will be encompassed by \$850,000 this year, despite some opposition in the Senate, chiefly that of Senator James Couzens, Republican, of Michigan.

Senator Couzens feels that the experiments are conducted chiefly for large aviation companies. Senator Hiram Bingham declared that the Army and Navy requirements were the chief concern. He declared that the laboratories at Langley Field, Va., were the best equipped in the world. He emphasized that a group of young engineers and scientists are being trained in a highly technical manner to solve the special problems of aeronautics. Of the amount spent by the government on aviation, Senator Bingham said, only one per cent, went to research, "to assure the soundness and future safety of this investment."

Between the years 1927 and 1931, Senator Bingham noted, the Army has spent around \$67,808,837 for aircraft, aircraft engines and accessories, and the Navy some \$68,492,621. Close coordination of the research work in Army and Navy and National Advisory Committee for Aeronautics laboratories, insured no duplication, argued the Senator from Connecticut, himself a world war officer in the air corps and an enthusiastic friend of aviation.

Senator Couzens, however, made it plain that he was not opposing the aeronautic research work per se, but only because he thought that the chief influences behind the determination to maintain the appropriations for this work were commercial concerns.

IMPROVED FILMS FOR AMATEUR MOVIES

FINER grained photographic emulsion developed for recording sharp images of distant stars has allowed the commercial perfection of an eight millimeter amateur motion picture film that takes four pictures upon the film space of one ordinary amateur 16 millimeter movie frame.

Although experimentally perfected, the new type amateur motion picture camera, film and projector has not yet been put on the market by the Eastman Kodak Company in whose laboratories it has been developed.

The quadrupling of the number of images on a foot of film is accomplished by running a 16 millimeter film through a special type of camera twice. The camera takes twenty-five feet of film and is sufficiently small to fit into the coat pocket. The first time through one half of the width of the film is exposed. Then the film is changed from one reel to the other and the other half is exposed. Each picture taken is only half the depth of an ordinary 16 millimeter film image. Twenty-five feet of the new film will therefore contain as many pictures as a hundred feet of the conventional amateur movie film and will run four minutes.

When the film is processed it is split down the center and the two pieces spliced end to end. Fifty feet of film, eight millimeters wide with perforations down one side, is delivered to the amateur photographer who must utilize a new eight millimeter projector in showing it.

The new eight millimeter movies are made possible by very fine grained sensitive photographic emulsion that of

nt.

resulted from a series of developments, among them the making of special films for astronomical use. The development of "koda-color" amateur movie film, the research striving for sound film that does not distort, and the commercial production of supersensitive 16 millimeter movie film, also contributed to the perfection of the new movies.

High optical and mechanical precision is necessary in the eight millimeter movie apparatus. The fast anastigmat lens of the camera is the size of a small pea, but is made of three pieces of glass each separately ground on each side with extreme accuracy.

The film image of the new eight millimeter movies is less than a twentieth of the area of the professional 35 millimeter movie film image.

CONTROL OF YEAST GROWTH

A POTENT chemical which seems to control and make possible the growth of yeast has been discovered in a wide variety of living materials by Dr. Roger J. Williams, biochemist in the University of Oregon. In a report given to the American Chemical Society, it appears that a yeast plant will not grow, even when given its full quota of sugar, phosphate, salt and other fundamental materials needed to build new structures, unless the special growth substance be present. This substance does not seem to belong to the so-called vitamin class.

Yeast was chosen because it grows rapidly, and, further, because its progress may quickly be reckoned by count of the simple cells under the microscope. For some years biochemists have vaguely understood that certain organic material, called "bios" fostered the growth of yeast. The investigations of Dr. Williams indicate that a relatively simple chemical, contained in the "bios" and elsewhere, is the real operating principle. While the substance has not yet been isolated in crystalline form, its behavior in purified solution indicates that its formula is less bulky than that of common sugar. While part of its chemical structure shows that it is like sugar, other reactions show it to be a weak acid.

Extracts were made of animals from each great division of zoology, including such diverse creatures as crabs, worms and oysters; and of plants as well. In every case the growth principle appeared, and was carefully separated from other material by electrolysis. Each time the purified extract caused yeast to grow prosperously on otherwise barren mineral food. Dr. Williams has been unable to find any type of animal from which he can not isolate the growth promoter.

The universal presence of the substance suggests the possibility that a single chemical may normally be in control of the greatest single life process. Until a precise chemical analysis reveals its exact structural formula, one can hardly gain even the first clue to the method by which it works. In the meantime there seems to be little cause for concern about the supply of the substance for either the baby, the puppy or the chick—as long as each of these young creatures eat most any natural food.

DYSENTERY IN RURAL AREAS

PEOPLE living in rural areas are in greater danger from the threatened epidemic of dysentery in the veterans' camp than residents of the District of Columbia or of other cities, in the opinion of health officials. This is because rural areas generally lack the sanitary facilities and careful protection of food and water supplies that metropolitan areas enjoy.

Dysentery is an intestinal disease. It may be caused by bacilli or germs, or by certain animal parasites called amebae. The amebic variety is generally found in the tropics and occasionally in southern United States. Epidemic dysentery in temperate zones is generally caused by bacilli. In the present outbreak, one case of bacillary dysentery has been reported to the District of Columbia health department and it is thought that the other, unofficially reported cases are probably of the

Dysentery is spread through the intestinal discharges which carry the germs of the disease. Unless these are disposed of in a sanitary manner and drinking water protected from them, the germs will be ingested by healthy people who in turn may contract the disease. In primitive life, and to some extent in rural areas of civilized countries, water for drinking is taken from sources which may easily be contaminated in this way. Food may also be contaminated by unclean food handlers and by flies, both of which may carry the germs mechanically from intestinal wastes to the food.

The outbreak of dysentery in the veterans' camp is not unexpected. Surgeon General Cumming, of the U. S. Public Health Service, on June 11 called the sanitary facilities at the camp "entirely inadequate and dangerous" in a warning to health officers throughout the country that epidemics might follow the route of the men when they returned to their homes. The country towns and farm settlements of the near-by states, Maryland and Virginia, are thought to be particularly menaced.

THE FAT CONTENT OF TUMORS

THE more severe, malignant tumors of high killing power, such as cancer, contain a much higher percentage of fatty substances than the less malignant tumors, Dr. Morio Yasuda, of Tokyo Imperial University, and Dr. W. R. Bloor, of the University of Rochester School of Medicine and Dentistry, have reported to the American Society for Clinical Investigation. Their report, published in the current issue of the society's Journal of Clinical Investigation, is based on chemical analyses of various kinds of human and mouse tumors made at the University of Rochester.

The tumors analyzed were divided into three groups according to degree of malignancy, so far as this could be estimated. In the first group of less malignant tumors the various fatty substances, such as phospholipids, cholesterol and neutral fat, were present in low percentages. These tumors included the types known as fibrosarcoma, neurofibroma, fibromyoma of the uterus and colloid adenoma of the thyroid gland.

pri By the tin eac Su Ab

tio hea car Pr

ble

The two malignant groups, containing a high percentage of fats, included human carcinomas, or cancers, of stomach, pancreas, breast, uterus and colon, and mouse carcinomas. Some of the tissues upon which the human tumors were growing, such as uterus muscle and colon tissue, were also analyzed, and found to have a much lower percentage of fatty substances than the tumors or cancers.

Other investigators who hope to aid in the solution of the cancer problem by chemical studies have reported similar findings since the original report of the Rochester scientists. These are the German group, R. Bierich, A. Detzel and A. Lang and a French investigator, Le May.

SEED BRIQUETTES

PLANTING forests by the brick instead of by the tree is a new method of forestry developed in Norway, according to Professor Svend Heiberg, of the Department of Silviculture of the New York State College of Forestry at Syracuse, who recently returned from Europe where he had been studying reforestation methods under a scholarship of the Charles Lathrop Pack Forestry Trust.

The seed bricks, or briquettes, Professor Heiberg states, are made of good soil and are 1½ by 1½ inches in size. Three or four seeds are placed in one end near the surface. The briquette is then dipped in paraffin except the side in which the seeds have been placed. The result is an easily transported product, which can be placed in the ground by means of a special instrument designed for the purpose. A machine can turn out 16,000 of the briquettes in a day. Professor Heiberg suggests that the idle lands of the United States may be reforested by planting briquettes instead of trees. He states:

"Tree seeds have followed ice cream and fuel into the form of the briquette and possibly many agricultural crops will be planted in the future in this way. We have been experimenting with the new system of planting at the college but have not had sufficient time to make any The method, however, seems absolute determinations. practicable for comparatively clear land. On land where there is considerable heavy growth this system might not succeed, as the young trees must start as seedlings in their permanent location. It requires a tree three or four years old to compete with heavy brush, grass and weeds and the briquettes would not be practicable for three- and four-year-old trees as the briquettes would have to be so much enlarged that they could not be handled economically.

"In the reforestation of comparatively clear fields," Professor Heiberg continues, "the briquette system will do away with tree nurseries. It has other important advantages. It permits the root system to develop normally and also avoids disturbance of the roots at the time of planting. It also makes possible reforestation work at almost any season of the year. It is only necessary to place the briquettes in the ground and let nature do the rest."

ITEMS

The force of gravity in the area between Rapid City, S. D., and across Wyoming to the Yellowstone National Park will be studied by a joint geological expedition during the next ten to twelve weeks. Geodesists of the U. S. Coast and Geodetic Survey will make precise determinations of the variations of gravity along profiles extending from Rapid City to the Yellowstone Park. A group of university geologists will cooperate by selecting the points at which observations are to be made. Professor Rollin T. Chamberlin, of the University of Chicago, Professor Walter H. Bucher, of the University of Cincinnati, and Professor W. T. Thom, Jr., of Princeton University, comprise this group.

SUGAR is the means of saving plants from drought, thickening their sap so that the sun and the winds can not pull all the water out. This is indicated by physiological researches reported by Dr. I. Vasiljev, of the Institute of Plant Industry, at Leningrad. Experimenting with wheat plants under varying conditions of drought, Dr. Vasiljev found that as drying proceeded, increasing amounts of starch and other insoluble carbohydrates were converted into sugars. When water conditions improved the process was reversed and the sugars again became insoluble carbohydrates of more complex structure.

HILDA BLACK KIFER and Hazel E. Munser, of the U.S. Bureau of Home Economics, report in the Journal of Agricultural Research that three varieties of spinach, Virginia Savoy, Princess Juliana and Viroflay, each of which has a different kind of leaf, one being dark green, one pale green and one bluish-green, and each having different degrees of curliness of leaf, had the same amount of vitamin A and B and nearly the same amount of vitamin C, judging from feeding tests on a small number of white rats.

THE idea that cortin, the vital hormone of the adrenal cortex gland, is a substance that is necessary for general well-being was supported by experiments reported by Dr. Frank A. Hartman, of the University of Buffalo, one of the group of experimenters who showed a few years ago that this extract effectively rescues from premature death patients suffering from Addison's disease. Dr. Hartman spoke at Syracuse before the meeting of the American Association for the Advancement of Science. Dr. Hartman finds that cortin is necessary for the maintenance of normal metabolism, growth, resistance to toxins and kidney function. Studies on neurotic sheep show that they become normal when injected with cortin, and success in treating the nervous sheep led to equally positive experiments on normal human beings which showed that cortin is necessary to brain functioning and smooth operation of other higher nervous cen-Cortin also enhances sexual activity, prevents fatigue and builds up resistance to cold. Dr. Hartman predicted that the hormone would prove to play an important part in the operation of other parts of the body.

lity,

onal tion the

ter-

ex-

A

ing

rohi-

of ton

ht,

an

io-

n-

ng

ıt,

ıg re

d 1e

THE WISTAR INSTITUTE BIBLIOGRAPHIC SERVICE

AUTHORS' ABSTRACTS

of all papers appearing in the journals listed below prior to publication of the articles in full. By this advance information biologists may familiarize themselves with contemporary research in a minimum of

Advance Abstract Sheets are issued twice a month, each sheet containing ten or more authors' abstracts. Subscription rate is \$3.00 per year.

Bibliographic Service Cards, following the Advance Abstract Sheets, also are issued twice a month. In addition to the authors' abstracts, the cards provide subject headings and complete bibliographic reference. The cards are convenient for filing and library records. Price, \$5.00 per year.

At regular intervals the authors' abstracts are assem-

bled and published in book form with complete authors' and analytical subject indices. Price, \$5.00 per volume. Liberal discount to subscribers to the Bibliographic Ser-

vice Cards.

JOURNAL OF MORPHOLOGY
THE JOURNAL OF COMPARATIVE NEUROLOGY
THE AMERICAN JOURNAL OF ANATOMY
THE ANATOMICAL RECORD
THE JOURNAL OF EXPERIMENTAL ZOÖLOGY
AMERICAN ANATOMICAL MEMOIRS
AMERICAN JOURNAL OF PHYSICAL ANTHROPOLOGY
JOURNAL OF CELLULAR AND COMPARATIVE PHYSIOLOGY
FOLIA ANATOMICA JAPONICA (Tokyo, Japan)
PHYSIOLOGICAL ZOÖLOGY (Chicago, Illinois)
STAIN TECHNOLOGY (Geneva, New York)
ECOLOGICAL MONOGRAPHS (Durham, North Carolina)

The Wistar Institute of Anatomy and Biology Philadelphia, Pa., U. S. A

The Foundations of Science

By H. POINCARE

Pp. xi + 553.

Containing the authorized English translation by George Bruce Halsted of "Science and Hypothesis," "The Value of Science" and "Science and Method," with a special preface by Poincaré, and an introduction by Josiah Royce. Price, postpaid, \$5.00.

THE SCIENCE PRESS

Grand Central Terminal

New York, N. Y.

BOSTON UNIVERSITY SCHOOL OF MEDICINE

ORGANIZED IN 1873

ANNOUNCEMENT

may be obtained by application to

THE REGISTRAR

80 East Concord Street

Boston

Massachusetts

Second Edition: Revised and Enlarged THE RAT: DATA AND REFERENCE TABLES

Memoir No. 6: 458 pages. Bibliography: 2206 titles

HENRY H. DONALDSON

Published by THE WISTAR INSTITUTE

Philadelphia, Pa., U. S. A.

Price, \$5.00

The Rat: A bibliography, 1924-1929.

L. E. DRAKE and W. T. HERON

1353 titles-with subject index. Price-50 cents

Orders may be sent to

The Wistar Institute, 36th Street & Woodland Ave., Philadelphia, Penna.

THE SCIENCE PRESS PRINTING COMPANY

PRINTERS OF

SCIENTIFIC AND EDUCATIONAL JOURNALS, MONOGRAPHS AND BOOKS

Correspondence Invited

LANCASTER, PENNSYLVANIA

SCIENCE NEWS

Science Service, Washington, D. C.

COSMIC RAYS

Cosmic rays do not bombard the earth with equal intensity from all directions, but their strength increases with the distance north and south of the earth's equator, Dr. A. H. Compton, of the University of Chicago, will report in the forthcoming issue of the *Physical Review*, the journal of the American Physical Society.

This is the first report from an extensive world-wide survey during which many physicists are making observations in remote localities. Dr. Compton transmitted this initial report from the Tasman Sea, during travel to new observing stations after research at Hawaii, New Zealand and Australia.

The definite differences in the intensity of the cosmic rays at different latitudes shown by Dr. Compton's report are likely to upset present ideas of the origin and nature of the cosmic radiation. Dr. Robert A. Millikan, of the California Institute of Technology, has consistently found that the intensity of the cosmic radiation is independent of the latitude at which the observations are made. Dr. Compton's report does not confirm Dr. Millikan's findings. Dr. Millikan has suggested that the cosmic rays may be due to the synthesis of heavy elements out of hydrogen and helium in the depths of the universe. This theory is based upon his findings that cosmic radiation bombards the earth equally from all directions.

Dr. Compton reports that so far as the measurements have gone they indicate "uniform variation with latitude, showing a minimum at or near the equator and increasing intensity toward the north and south poles." At sea-level, the difference between intensity at latitude 45 degrees and zero degrees is roughly 16 per cent., whereas at an elevation of 9,000 feet the difference is about 23 per cent. This would indicate, Dr. Compton says, that it is the least penetrating part of the cosmic rays which varies most rapidly with latitude. No significant variations with longitude have been noted. Observations recorded in Dr. Compton's report include those made from Mount Evans in this country, from the Jungfraujoch in Switzerland, as well as the measurements made by Dr. Compton and associates during this present extensive trip.

DOUBLE WEIGHT HYDROGEN ATOMS

A PLENTIFUL supply of newly discovered double-weight hydrogen atoms exists in the apparatus used commercially to break down water into oxygen and hydrogen gases by passing electricity through it. This has been determined through joint research by Dr. E. W. Washburn, of the National Bureau of Standards, and Dr. Harold G. Urey, of the department of chemistry of Columbia University.

The existence of a hydrogen isotope of atomic weight two, twice the ordinary hydrogen atom of mass one, was discovered last year by joint research between the same two institutions. This was hailed as an important development bearing upon the constitution of matter and the way in which elements are distributed in nature.

Ways of separating the heavier atoms of hydrogen, which are relatively rare, from the light atoms of hydrogen, which are plentiful, were investigated. It was recognized that when hydrogen gas is formed by electrolysis of water, the two kinds of hydrogen atoms or ions do not have an equal chance to get into the hydrogen gas that is formed. The heavy, or double-weight, hydrogen atoms would be likely to be held back in the water, while the lighter isotope one hydrogen would be most likely to pass off.

To test this theory of the concentration of isotope two hydrogen, a water electrolysis experiment was begun at the Bureau of Standards. This test is not yet complete. But it was possible to take advantage of water electrolysis processes operated commercially over a period of a year by plants producing oxygen and hydrogen gas for industrial use. As every schoolboy knows, water consists of two parts hydrogen and one part oxygen, and electricity breaks it up into the two gases. Residual water from two such plants was broken down into hydrogen and oxygen gases at Columbia University and examined with the spectroscope. As was expected, larger amounts of the isotope two hydrogen were found than of the isotope one variety.

Plans are under way for the concentration of large quantities of the double-weight hydrogen from the old water of electrolysis plants in order that this unusual kind of hydrogen may be thoroughly investigated.

DEATHS FROM PELLAGRA

DEATHS from pellagra, often called the "hard-times disease" because it is caused by a typical hard-times diet which lacks certain vitamins, have, surprisingly, decreased during the recent hard times. A decline in the pellagra death-rate during 1930 and 1931 is reported in the forthcoming Statistical Bulletin of the Metropolitan Life Insurance Company.

Figures of the U. S. Public Health Service for forty-two states also show a decline in pellagra deaths during these two years. Public health officials point out, however, that patients do not usually die of pellagra during the first or second year they have the disease. Consequently many cases may have developed within the last year or so which have not yet shown up in the mortality figures. Likewise, more is known about how to prevent or to treat the disease now than during previous "hard times." For example, several state health departments in the South are distributing free yeast, which is one good preventive of pellagra.

"The facts do not show that the higher mortality rates always come when business is at a low ebb," the insurance company's statisticians point out. The pellagra death-rate declined during the World War when employment was general and high wages prevailed. After 1924, when the lowest death-rate for the twenty-one-year period

r and

ogen,

ydro.

Was

elec-

10 an

ydro-

eight,

1 the

d be

two

n at

lete.

elec-

riod

gas

ater

and

ter

gen

ned

nts

the

ge

old

al

e.

from 1911 to 1931 was recorded, the pellagra deaths began increasing.

"But in 1930 and 1931, in the face of wide-spread economic disturbances, deaths from pellagra declined quite in line with the general death-rate," the report concludes.

Pellagra may be prevented by vitamin G, found in fresh lean meat, milk, yeast and certain vegetables. Except for yeast, these are expensive foods and among the first to be dropped from the diet when finances run low. The typical hard-times diet of the poor in the South, meal, molasses and salt pork, is entirely lacking in the anti-pellagra vitamin.

Digestive and nervous disturbances, skin irritations, extreme weakness, convulsions and even insanity are characteristic of the disease.

ELECTRICALLY INDUCED FEVER

THE growth of radiothermy, the new method of treating disease by electrically inducing fever in patients, was described by Dr. Willis R. Whitney, director of research for the General Electric Co., before the International Electrical Congress at Paris.

Dr. Whitney called radiothermy one of the newer applications of the vacuum tube. Radio broadcasting is only one use for the principles involved in the generation of an electromagnetic field from vacuum tubes.

"Tubes of the radio type can be used to produce electromagnetic waves as long as 1,000 meters and as short as one ten-thousandth of a meter," he said. "It is not difficult to believe that within this range invisible assets await only further research to disclose them."

The treatment of arthritis, boils and carbuncles by radiothermy was named as an application of this method. Radio heating has also been substituted for malaria, which was given paresis patients to induce a curative fever in them.

In the beginning of the research to find out what the high frequency waves could be used for, first liquids, then jellies and finally insects and animals were used instead of human patients.

"Small insects, such as fruit flies, when submitted to fields of a few watts of radio energy, apparently died instantaneously," Dr. Whitney said, "and the deposition of moisture from their bodies on the walls of the tube near them indicated that death was due to overheating. When the same insects were exposed to the field in the dormant condition produced by a surrounding temperature of zero degrees Centigrade, it was possible by careful manipulation to revive them and to make them fly about in zero air exactly as though midsummer temperatures prevailed."

ITEMS

In spite of wide-spread unemployment and wage reductions, 1932 has been so far "the best of all health years" for a large section of the industrial population of the United States and Canada. Health conditions from the first of the year to the end of May have been better than ever before for the same period of the year, statistics collected by the Metropolitan Life Insurance

Company show. During this period the death-rate among the company's industrial policy-holders reached the unprecedentedly low figure of 9.2 per 1,000. The death-rate for May alone was 8.5 per 1,000, the lowest, with the exception of May, 1931, ever recorded for this month. The low rates are due chiefly to large drops in the death-rates for three important diseases, tuberculosis, pneumonia and influenza.

MILLIONS of years ago California and Oregon were forested with trees unlike those now found there. A Carnegie Institution of Washington expedition has found on the slopes of the Venezuelan Andes the living close relatives of ancient trees of western America. Professor Ralph W. Chaney, of the University of California, and Dr. Erling Dorf, of Princeton University, by traveling into South and Central America were able to see a picture of what the ancient forests of America's west coast must have looked like millions of years ago before there were human eyes to see them. Their discovery upholds the theory that forests that once existed in North America were pushed south as the climate became increasingly cold and dry.

THERE is an island in the Kara Sea, north of the line where Europe and Asia join. Professor V. Vyse, Russian geographer, has made this declaration as the result of his studies of data on water temperatures, ice drift, bottom contours and other phenomena brought back by the Soviet ice-breaker Sedov. This is not Professor Vyse's first prediction of this kind. Before the Sedov exploratory cruise in 1930, he based a similar declaration on similar data for another location; and the island was found there as he said it would be. It was named Vyse Island, in his honor.

Competition with the cork oak, classic cork-producing tree of southwestern Europe, may be offered by the "velvet tree," native to wastelands in Japan, China and Russian Asia. Professor E. E. Kern, of the Institute of Plant Industry, has been investigating its possibilities, and finds that though the cork it produces will not do for bottle stoppers, it is quite satisfactory for insulation and other purposes. The tree belongs to the same botanical family as the citrus fruits. It is known as Phelodendron, which is Greek for "cork tree." It reaches a height of about fifty feet, and attains an extreme age of 300 years. Cultivation improves the quality of its corky bark.

DIFFERENT butterfly species seem to have their own individual taste in perfume. The perfume exuded by the scent scales of common American species of butterflies covers a wide variety of delightful odors resembling some of the more fragrant flowers, according to a report by Austin H. Clark just issued by the Smithsonian Institution. Sandalwood, red clover, milkweed, crushed violet stems, dried sweet grass, violets, musk, mignonette, and sweet briar are among the flower fragrances imitated by the butterflies. Unlike fashions in the human world, it is the male who wears the perfume. Females of the same species whose males exude the delicate pleasant odors give off a powerful nauseating smell.

JUL

How Evol

erati

said

addr

of E

show

has 1

Ento

St

knov

stud

grow five

anin

erati

by v

conv

F

over

thir

cele

pas

ting

del

Wee

of

gr

fr

th

W

RECENT SCIENTIFIC BOOKS

which by arrangement with The Science Press are offered by G. E. STECHERT & CO., 31 East 10th St., New York to which firm orders should be addressed

MATHEMATICS-PHYSICS

Alberti, Egon. Braun'sche Kathodenstrahlroehren und

ihre Anwendung. 158 ill. pp. viii + 214. \$5.33. Bieberbach, Ludwig. Analytische Geometrie. 2nd ed.

Ill. pp. iv + 141. \$1.44. Hilbert, David. Gesammelte Abhandlungen. (4 vols.) Vol. 1: Zahlentheorie. pp. xiv + 539. \$11.52.

Jahrbuch und Abhandlungen des Forschungsinstitutes der Rhoen-Rossitten-Gesellschaft e. V. 1930. Ed. by Walter Georgii. 164 ill. pp. xiv + 87. \$2.40.

Meidinger, Walter. Die theoretischen Grundlagen der photographischen Prozesse. 300 ill. pp. x+513. (Handbuch d. Photographie) \$14.35.

Mie, Gustav. Elektrodynamik. 210 ill. pp. xii + 502. \$10.80.

ASTRONOMY

Becker, Friedrich. Spektral-Durchmusterung d. Kapteyn-Eichfelder des Suedhimmels. Tl. 3: "Zone-45 Grad." 194 pp. \$5.28.

Becker, Friedrich. Zur Struktur des Sternsystems in der Umgebung der Sonne. Pt. 2: "Die Verteilung d. Spektren von Sternen bis zur 12. Groesse in 43 Eichfeldern d. Suedhimmels." 6 plates. 21 pp. \$1.73.

Luebke, Anton. Der Himmel der Chinesen. Ill. 141 pp. \$1.44,

Geschichte der Fixsternhimmels, enth. d. Sternoerter d. Katalog d. 18. u. 19. Jh. Ed. by the Preuss. Akademie d. Wissenschaften. Abt. 1. Der noerdl. Sternhimmel. Vol. 17: 16h Rektaszension. pp. xiv + 177. \$7.78.

Nautisches Jahrbuch oder Ephemeriden und Tafeln zur Bestimmung d. Zeit, Laenge und Breite sur See nach astronomischen Beobachtungen. Ed. by the Reichsver-kehrsministerium. Jg. 82. 1933. pp. xvi + 295. \$1.34.

CHEMISTRY & CHEM. TECHNOLOGY

Berg, Georg. Das Vorkommen der chemischen Elemente auf der Erde. 33 plate. pp. vi + 204. \$4.20.

Claus-Fincke. Saeuerebestaendige Bronzen, Kupfer, Zinnbronzen, Rotguss und verwandt Legierungen als chemischbeanspruchte Werkstoffe im allgemeinen Maschinen- und Apparate-Bau. Ill. pp. viii + 136. \$3.31.

Ebert-Tubandt. Leitfaehigkeit und Ueberfuehrungszahlen in fluessigen u. festen Elektrolyten. (Fajans, Elektrochemie, Halbbd. 1) \$9.12. Edlbacher. Siegfried. Praktikum der physiologischen

Chemie. pp. vi + 92. \$1.08.

Fischer, Emil. Untersuchung v. Asphalt- und Pechgemen-

gen. Ill. 116 pp. \$2.47. Freudenberg, Karl. Stereochemie. Eine Zusammenfassung d. Ergebnisse, Grundlagen & Probleme. (ca. 8 Lfgn.) Lfg. 1. Ill. pp. iv + 160. \$4.32 (on Subser. only)

Frobenius, Leo. Morphology of the African bow-weapon

(Morphologie d. afrikanischen Bogengeraetes) Transl. by Lommel. 26 charts. 288 ill. 44 pp. \$7.56. Halama, Marta. Transparentfolien (Cellophan, Transparit, Heliozell, Ultraphan etc.) Herstellung, Verarbeitung, Verwendung u. Wirtschaft v. transparenten Viskose- u. Acetatfolien, Flaschenkapseln u. aehnlichen Gebilden, sowie Gelatinefolien u. Gelatinekapseln. 110 ill. 19 Orig. Mustern. pp. xvi + 292. \$4.32.

Handbuch der technischen Elektrochemie, Ed. by V. Engelhardt. Vol. I, 2: "Die technische Elektrolyse waesseriger Loesungen." 329 pp. \$7.68.

Haworth, Walter. Die Konstitution der Kohlenhydrate. Transl. by Hagenbach. Ill. (Wissenschaftl. Forschungsberichte) 107 pp. \$2.16.

CHEMISTRY & CHEM. TECHNOLOGY—Continued

Lemmel, Hans Heinrich. Gewinnung, Veredlung und Verarbeitung der Oele und Fette. Aus Praxis, fuer Praxis und Studium. Ill. 408 pp. \$8.18.
Mittasch, & Theis. Von Davy und Doebereiner bis Dea.

con, ein halbes Jahrhundert Grenzflaechenkatalyse. III.

278 pp. \$4.44. Nowak, Alfred. Chemische Holzverwertung. (4th ed. of "Bersch, Verwertung d. Holzes auf chem. Wege") pp. viii + 303. \$2.40.

Vageler, Paul. Der Kationen- und Wasserhaushalt des Mineralbodens vom Standpunkt d. Physik. Chemie u. s. Bedeutung f. d. land- u. forstwirtschaftl. Praxis. 34 ill. pp. vi + 336. \$7.15.

Wells, H. G. Die chemischen Anschauungen ueber Immunitaetsvorgaenge. 2nd ed. Transl. by Wigand. 314 pp. \$3.12.

GEOLOGY & GEOGRAPHY

Bessmertny, Alexander. Das Atlantisraetsel. Geschichte und Erklaerung der Atlantishypothesen. Ill. 212 pp. \$1.59.

Braak, C. Klimakunde von Hinterindien und Insulinde.

(Handbuch der Klimatologie) 125 pp. \$1.49. Chudoba, Karl. Mikroskopische Charakteristik der Chudoba, Karl. gesteinsbildenden Mineralien. 306 ill. 13 plates. pp. viii + 213. \$4.32.

Frobenius, Leo. Schicksalskunde im Sinne des Kulturwerdens. 203 pp. \$1.34.

Gross, Walter. Die Arthrodira Wildungens. (Geologische und Palaeontologische Abhandlungen) Ill. 61 pp. \$3.86. Hann, Julius. Handbuch der Klimatologie. 4th ed. by Knoch. Vol. 1: Allg. Klimalehre. 26 ill. pp. xvi + 444.

Kraus, E. Der nordalpine Kreideflysch. Geol. Forschgn. im Allgaeu u. in Vorarlberg. 58 ill. 7 plates. 138 pp. \$7.68.

Patsch, Carl. Beitraege zur Voelkerkunde von Suedosteuropa. Pt. 5: "Aus 500 Jahren vorroem. u. roem. Geschichte Suedosteuropas. Pt. 1: Bis zur Festsetzg. d. Roemer in Transdanuvien." 206 pp. \$2.76.

Alfred Wegeners letzte Groenlandfahrt. Die Erlebnisse d.

deutsch. Groenlandexpedition 1930/31 geschildert von seinen Reisegefaehrten u. nach Tagebuechern d. Forschers. Ed. by Else Wegener. 122 ill. 11 charts. 303 pp. \$1.92.

BOTANY

Bergdolt, Ernst. Morphologische und Physiologische Untersuchungen ueber Viola. (Botanische Abhandlungen)

Ill. 120 pp. \$1.82. Eig, A. Les Elements et les groupes phytogeographiques auxiliaires dans la flore palestinienne (2 Abt.) 1. Texte. 201 pp. 2 Abt. cplt. \$14.40.

Graenzlin, Fritz. Orchidacearum Sibiriae enumeratio. 103 pp. (Repertorium tabilis. Beih. 65) \$3.60. (Repertorium specierum novarum regni vege-

Nannfeldt, J. A. Studien ueber die Morphologie und Systematik der nichtlichenisierten inoperculaten Discomyceten.

368 pp. \$5.40.

Pascher, A. Die Suesswasserstora Mitteleuropas. Heft 9. Zygnemales. 2nd ed. Ill. 232 pp. \$2.40.
Sorauer, Paul. Handbuch der Pstanzenkrankheiten (6

vols.) Vol. 3: "Die pflanzl. Parasiten, ed. Appel." Pt. 2. 195 ill. pp. viii + 948. \$15.84. Steinecke, Fritz. Die Phylogenie der Algophyten. Versuch e. morphologischen Begruendung d. natuerl. Systems d. Algen. Vorgetr. u. vorgelegt v. Carl Mez in d. Sitzg. am 25. Nov. 1931. pp. ix + 171. 24 pp. ill. \$4.32.

SCIENCE NEWS

Science Service, Washington, D. C.

THE ENTOMOLOGICAL CONGRESS

ACCORDING to a dispatch sent from Paris by Dr. L. O. Howard new varieties are appearing almost every day. Evolution is slow but in creatures that have many generations a year, it may seem rapid in comparison. So said Dr. Paul Marchal, eminent French scientist, in his address as president of the Fifth International Congress of Entomology which opened its meeting on July 18. He showed the enormous advance in general biology that has been made since the First International Congress of Entomology was held at Brussels in 1910.

Students of genetics have seized upon the little flies known as Drosophila as the most available form for study, and the T. H. Morgan school of geneticists has grown up from their labor. A Drosophila has twenty-five generations in a year. It would take the higher animals scores of years to pass through as many generations.

With a wealth of knowledge of results accomplished by workers in all branches of biology and in all parts of the world, Dr. Marchal delivered a brilliant and very convincing address.

For the past few days students of insects from all over the world have been arriving in Paris. No less than thirty-three countries are represented. Fortunately 1932 is the year when the Entomological Society of France is celebrating its one hundredth anniversary and for the past three days the centenary has been celebrated by distinguished functions. The President of the Republic presided over the inaugural meeting of the centenary, and the ceremonies ended in a great banquet at which delegates from foreign countries spoke briefly.

The Entomological Congress occupied itself for a week with meetings devoted to all branches of the study of insects and adjourned on July 24.

PREHISTORIC SCIENCES

PREPARATIONS are well advanced in London for welcoming the first meeting of the new International Congress of Prehistoric and Protohistoric Sciences to be held
from August 1 to 6. The meeting is being held at the
invitation of the Society of Antiquaries of London and
the Royal Anthropological Institute. Sir Charles Peers,
president of the Society of Antiquaries and Inspector of
Ancient Monuments, will be the first president.

Over 500 distinguished archeologists from all over the world have intimated their intention to attend. Among them are Dr. George Grant MacCurdy, of Yale University; Dr. T. J. Arne, of Stockholm; the Abbé Breuil, of Paris, and Dr. O. Menghin, of Vienna.

A forecast of the program of the five sections into which the congress will be divided promises much interesting matter for discussion. Dr. L. S. B. Leakey will describe the latest results of his African archeological investigations in Kenya. His discoveries of human remains in very early geological deposits with very primitive types of stone implements appear to carry back

Homo sapiens, the modern type of man, to an age far beyond anything previously dreamed of by anthropologists. Miss D. A. E. Garrod will describe the excavation of caves on Mount Carmel.

One section of the congress is devoted to the period of transition from prehistory to history, the period which covers the arrival of the Saxons in England and the great movements of the Vikings from Scandinavia over the rest of Europe. Papers will be devoted to each of these subjects, as well as to the history and origin of the little known Pictish tribes of Scotland who gave the Romans so much trouble when they were in occupation of Britain.

After the formal meetings are over, excursions will be made to East Anglia to view the sites of Reid Moir's discoveries of the earliest known types of stone implements, and to Stonehenge and Avebury.

THE WORK OF ROBERT KOCH

Most of the practices of modern preventive medicine and all of bacteriology are owing to the discoveries of Robert Koch, Dr. William Charles White, of the U. S. National Institute of Health, declared in a tribute to Koch delivered in London, on July 21, before the British Medical Association at its centenary meeting.

"So long as man writes his own history he will continue to picture the achievements of Robert Koch in ever brighter terms," Dr. White prophesied.

"If we review the practices of modern preventive medicine such as the purification of water supplies, disposal of sewerage, sterilization of food supplies, pure and clean milk, cleanliness of person and home, preventions of specific diseases in man and a host of diseases of animals and plants, we are struck at once with the fact that all of them which owe their origin to bacterial life as the cause of disease are traceable directly or indirectly to the sureness of knowledge and to the methods which Koch provided. It may be safely said that this knowledge culminated in the masterly work which resulted in the discovery of the tubercle bacillus."

Antitoxin for diphtheria was discovered by two of Koch's pupils, Behring and Kitasato, while working in his laboratory. It is probable that he had much to do with this great discovery, which, with smallpox vaccination, stands alone among practices of preventive medicine for sureness of result.

Looking into the future, Dr. White sees the influence of Koch's great discoveries still at work in the various struggles of man to control his scourges. Specifically he called attention to three lines of research: studies of epidemiology; studies of specific methods of disease control, of the resistance to heat and general susceptibility of the filterable viruses and of the life cycles of bacteria; studies of the way different strains of bacteria produce from their food practically all the proteins, carbohydrates and fats that are found in plants and animals and the relation of these to plant life and diseases, to animal life and disease and finally to man himself.

DISEASES THAT ARE CARRIED THROUGH THE AIR

THE old belief that diseases are carried through the air is substantiated for at least one group of contagious diseases in recent studies made by Dr. Merl G. Colvin, of the Yale Medical School. Ordinarily it is supposed that microorganisms will not travel through the atmosphere unless attached to droplets of moisture so that an individual must come comparatively close to an infected person or come in direct contact with something with which the patient has had contact in order to contract the disease

The group of diseases known as the virus diseases, of which chicken-pox and measles are common examples, are supposedly caused by minute ultramicroscopic forms so small that the ordinary microscope does not magnify enough to show them. The viruses themselves are difficult to handle in the laboratory. Bacteriophage, however, which approximates the size of the viruses, is comparatively easy to handle and so has been used by Dr. Colvin as a test agent in a study of the spread of virus.

Dr. Colvin has been able to measure the distances which bacteriophage travels through the air, the speed at which it travels, and finds, contradictory to the common belief, that it traveled some thirty-five feet from his laboratory in five miuutes. Not only that, but bacteriophage lurked in the dust of his room for at least 18 days. After a thorough sweeping and mopping of the room there was more phage in the air than before, which, according to Dr. Colvin, shows the inefficiency of certain modern cleaning methods.

While there are differences between bacteriophage and viruses, Dr. Colvin feels that it is more than probable that virus diseases may be air-born and that this may in part explain why they are so very contagious.

THE NEW NAVY AIRSHIP

THE naval airship, The Macon, under construction at the mammoth airship dock at Akron, Ohio, will embody several changes as compared with her sister ship, The Akron, completed last year. Such changes do not extend to general measurements. The overall length of 785 feet and maximum diameter of 132.9 feet and the shape were set at the outset for both ships. Neither will they affect location and design of control car and control surfaces.

In relation to substituting a gear ratio of two to one in *The Macon* for the ratio of 1.75 to one in *The Akron*, the eight propellors of the latest airship will be bigger but slower than the eight of *The Akron*. This, airship engineers believe, will result in greater efficiency.

The Macon will emerge from her cocoon-like home entirely equipped with gelatin latex fabric cells, somewhat lighter in weight than rubberized latex fabric cells, while The Akron's cells are constructed of half of each kind of these materials. Gelatin latex fabric for cells is a development of Goodyear-Zeppelin laboratories. From two to four small helium valve hoods will appear on top of The Macon, as compared with a single one for valves of The Akron, a change to decrease "drag" and so bring greater speed. No operator will be needed for The

Macon's telephone switchboard, as with The Akron, since an automatic board is being set up for the ship's sixteen stations. Engineers are also cutting down partition weight on The Macon. The Akron is equipped with seven bunk rooms but The Macon will have only two. The Macon is also to embrace changes in the operation of the ingenious water recovery system found on The Akron, in which condensers on motors at the exhaust liquefy combustion vapors. Under this system, consumption of fuel does not lighten the ship, but instead builds up a supply of water ballast for constant equilibrium.

ITEMS

DIGGING into the lowest depths of an Eskimo village deposit in Alaska, Dr. Aleš Hrdlička, of the U. S. National Museum, has made the discovery of the remains of a people different from the Eskimos. These older inhabitants of the village were neither Eskimos nor Aleuts. They resembled very closely the type of the California Indians. The site where Dr. Hrdlička is excavating is at Larsen's Bay, Kodiak Island, off southern Alaska. Commenting on the unusual condition in this Alaskan village where Indians gave place to Eskimos long ago, Dr. Hrdlička writes: "This is, so far as I know, the first case on this continent where two different peoples are actually found in the same deposit."

You are not so tall when you stand up as when you lie down. The amount you gain in length by stretching out on your back varies with height and sex, but it may be as much as an inch in some cases. This simple method of adding at least a fraction of a cubit to your stature was observed by Dr. Carroll E. Palmer in the course of an investigation at the School of Hygiene and Public Health of the Johns Hopkins University, for the purpose of finding a basis of comparison between the height tables of infants, which are of course based on prone measurements, and those of older children.

THERE were giants in the earth in the Coal Age, but they were all trees: weird growths like the modern horsetail rushes, but fifty feet high and a foot thick; others just as strange, with sword-like leaves, that have left no living representatives. But all the land animals, in those days before the dinosaurs, were comparatively puny things: small creatures very much like modern salamanders, not over a foot or two long; though some, by virtue of tapering tails, attained a length of nine feet. And there were a few eel-shaped ones, like the so-called "blind-worms" of the present day. bones are not at all well preserved. Most of the little we know about them comes from impressions of their bodies in coal beds, and from more abundant tracks of their feet in muds that subsequently hardened into shales. But sufficient skeletal material has been gathered to enable Dr. William K. Gregory, of the American Museum of Natural History, New York, to direct the sculpturing of a restoration, a duplicate of which has also been prepared for the Field Museum of Natural History in Chicago.

TH

ed

ily

nd

n-

PUBLICATIONS

of the

ARNOLD ARBORETUM of HARVARD UNIVERSITY

Journal of the Arnold Arboretum of Harvard University.

An illustrated journal dealing with taxonomy, cytology and plant pathology chiefly in reference to ligneous plants.

to ligneous plants.

Subscription \$3.00 per year; beginning with vol. XIV (1933) \$4.00 per year. Single copies \$1.25.

Contributions from the Arnold Arboretum of Harvard University.

A series of longer papers with the subject matter similar to that in the Journal, issued at irregular intervals; each paper priced separately.

- No. 1. THE HYPODERMATACEAE OF CONIFERS. By G. D. Darker. 131 pp. 27 pl. \$3.00.
- No. 2. TAXONOMY AND GEOGRAPHICAL DISTRIBUTION OF THE GENUS MILESIA. By J. H. Faull. (In press.)
- No. 3. STUDIES IN THE BORAGINACEAE, IX. By I. M. Johnston. (In preparation.)

Address

THE ARNOLD ARBORETUM, Jamaica Plain, Mass.

APPARATUS and REAGENTS

FOR LABORATORIES OF CHEMISTRY and BIOLOGY

Our new 1044-page catalogue illustrates and describes 11,814 Apparatus items and lists 2,762 Reagent items, all controlled in quality, currently priced and stocked for immediate shipment.

ARTHUR H. THOMAS CO.

WEST WASHINGTON SQUARE

PHILADELPHIA, U. S. A. Cable Address: BALANCE, Philadelphia

NEW (15th) EDITION OF

THE MICROSCOPE By SIMON HENRY GAGE

Revised throughout, and a wholly new chapter on the Ultra-Violet Microscope. Price, \$4.00.

THE COMSTOCK PUBLISHING CO, Ithaca, N. Y.

A Hoke Micrometric Control

is handy for bubbling gases through solutions.

Ask for folder SM

Hoke Incorporated 22 Albany St., New York City



BOSTON UNIVERSITY SCHOOL OF MEDICINE

ORGANIZED IN 1873

ANNOUNCEMENT

may be obtained by application to

THE REGISTRAR

80 East Concord Street

Boston

Massachusetts

THE WISTAR INSTITUTE BIBLIOGRAPHIC SERVICE

ISSUES

AUTHORS' ABSTRACTS

of all papers appearing in the journals listed below prior to publication of the articles in full. By this advance information biologists may familiarize themselves with contemporary research in a minimum of time

Advance Abstract Sheets are issued twice a month, each sheet containing ten or more authors' abstracts.

each sheet containing ten or more authors' abstracts. Subscription rate is \$3.00 per year.

Bibliographic Service Cards, following the Advance Abstract Sheets, also are issued twice a month. In addition to the authors' abstracts, the cards provide subject headings and complete bibliographic reference. The cards are convenient for filing and library records. Price, \$5.00 per year.

At regular intervals the authors' abstracts are assem-

At regular intervals the authors' abstracts are assembled and published in book form with complete authors' and analytical subject indices. Price, \$5.00 per volume. Liberal discount to subscribers to the Bibliographic Service Cards.

JOURNAL OF MORPHOLOGY
THE JOURNAL OF COMPARATIVE NEUROLOGY
THE AMERICAN JOURNAL OF ANATOMY
THE ANATOMICAL RECORD
THE JOURNAL OF EXPERIMENTAL ZOÖLOGY
AMERICAN ANATOMICAL MEMOIRS
AMERICAN JOURNAL OF PHYSICAL ANTHROPOLOGY
JOURNAL OF CELLULAR AND COMPARATIVE PHYSIOLOGY
FOLIA ANATOMICA JAPONICA (Tokyo, Japan)
PHYSIOLOGICAL ZOÖLOGY (Chicago, Illinois)
STAIN TECHNOLOGY (Geneva, New York)
ECOLOGICAL MONOGRAPHS (Durham, North Carolina)

The Wistar Institute of Anatomy and Biology Philadelphia, Pa., U. S. A.

JU

age

was

stol

I

ute

sto

bef

ligh

whi

of

sig

ligi

lig

Gis

sto

nea

the

do

nu

bec

fre

top

lig

we

SI

p

SCIENCE NEWS

Science Service, Washington, D. C.

RESEARCH ON TUBERCULOSIS

An international attack by the governments of the world on the great white plague was suggested by Dr. William Charles White, of the U. S. National Institute of Health, at the meeting in London on July 27 of the British Medical Association. Dr. White pointed to the International Postal Union as the best example of international governmental cooperation so far achieved.

"Among the great economic problems with which the world is faced, tuberculosis stands probably at the top of the list," he continued. "It was the first disease problem to reach the status of International Congress and Conference and to-day no civilized nation is without its national, state, county and municipal organization for the prevention and cure of tuberculosis."

Each nation is trying to solve the problem in its own way, but Dr. White thinks cooperation, which is resorted to during war and other periods of international stress, would bring better results. At present even the best utilization of available knowledge brings the disease under only partial control, and that with great expenditure of effort and money. In Dr. White's opinion, cooperative search for more knowledge about the disease is required for a real conquest of this plague.

Dr. White described the plan for research being followed by the National Tuberculosis Association, a volunteer organization in America. He is chairman of the association's committee on medical research which directs the work along this line.

Under this plan, investigators in various laboratories are studying the living chemistry of the different organisms of the tuberculosis germ. Large quantities of each of them are grown on standard culture material. Chemists are analyzing these germs and the material on which they grow. Biologists are studying the effects on tuberculous and non-tuberculous animals of the different chemical constituents of these germs that have already been obtained by chemical analysis. In addition, the living chemistry of the cells in the animal's body in which the t.b. germs live is being studied, and how the chemical reactions of the cells are changed after they are infected with the tuberculosis organism are being investigated.

On the more immediately practical side, investigations have been made to obtain standards for the skin test for susceptibility to tuberculosis and for strength of x-rays used in diagnosing the condition and following its progress. In the first instance, the chemical substance responsible for the reaction in the skin test has been isolated chemically. In the second, means have been developed for measuring the efficiency of the x-ray machinery from the electric current to the film on which the shadows are shown. These two developments give a better means of comparing notes on the progress of the disease and the effect of various kinds of treatment. Extension of similar research throughout the world was urged by Dr. White.

THE EFFECTS OF ALCOHOL ON THE OFF. SPRING OF RATS

(Copyright, 1932, by Science Service)

ALCOHOL does not cause defective children of guineapigs that are kept intoxicated six days out of seven for years on end, Miss F. M. Durham, of the National Institute for Medical Research, has concluded after repeat. ing experiments of Dr. Charles R. Stockard, American biologist. Neither does extreme and constant intoxication of guinea-pig mothers and fathers result in families smaller than those of sober guinea-pig parents. Miss Durham considers that she has definitely disproved Dr. Stockard's suggestion that alcohol in circulation produces heritable permanent deterioration of the race by injuring the germ plasm even when the intoxicated mother and father guinea-pigs do not show any obvious damage. Miss Durham's researches which have extended over many years are reported in a publication of the Medical Research Council. Miss Durham suggests that a vitamin deficiency or inheritable strains in the animals used by Dr. Stockard may have caused his results.

In 1924, Dr. Charles R. Stockard, of Cornell University Medical School, New York City, reported as the result of guinea-pig experiments that alcohol probably eliminates the unfit and that races addicted to its use therefore outstrip the moderate races. He found higher infant mortality, lower birth-rates and more defective children among the offspring of guinea-pigs that were kept intoxicated with alcohol fumes most of the time for as long as six years. He attributed these injurious effects to the alcohol.

But Dr. Stockard at that time said: "It is highly improbable that human beings have ever injured or eliminated their normal resistant germ cells with alcohol. Alcohol probably has eliminated some of the bad. Those nations of men that have used the strongest alcoholic beverages through many generations have now, from a standpoint of performance and modern accomplishments, outstripped the other nations with less alcoholism in their history."

THE FIRE MENACE OF THUNDER STORMS

A FEW minutes of rain often is all that marks the difference between a lightning storm that will start a forest fire and a "safe" storm that will not.

This is one of the fire-weather facts appearing from a study of weather and forest fire records in the northern Rocky Mountains, compiled by H. T. Gisborne, of the Northern Rocky Mountain Forest Experiment Station, and reported to the U. S. Weather Bureau.

Mr. Gisborne undertook his statistical research in order to provide forest administrators, and especially fire fighters, with data that will enable them more efficiently to meet the late-summer menace of lightning caused fires. In the northern Rockies, and in many other parts of the West, lightning is by far the largest

single source of forest fires, exceeding even careless campers and spark-scattering lumbermen's engines.

Mr. Gisborne's study was made on a five-year record compiled of data gathered by observers on over 200 mountain peaks in three states. He found that the average number of thunderstorms per summer, eighty-eight, was three or four times as large as had previously been thought to be the case, based on observations from low-land stations. He also found that the danger from a storm bore a direct relation to the duration of rainfall both before and after the lightning began to flash, as well as to the number of lightning strokes that reached the ground.

Lightning storms that caused fires averaged 8.7 minutes of rainfall before the lightning began, whereas storms that did not start fires had 14.6 minutes of rain before the lightning. Fire-causing storms followed the lightning with only 30.8 minutes of rain, on the average, while "safe" storms kept up the rainfall for an average of 44 minutes. These figures are regarded as quite significant, for the pre-lightning rain wets the dry litter on the ground if it falls long enough, while the post-lightning rain, if sufficient, will put out fires which the lightning has started.

One assumption, though logical, was disproved by Mr. Gisborne's study. This was that the "dry" thunderstorm, which sends little or no rain to the ground beneath, is especially dangerous. Figures showed that these storms are comparatively rare, and that when they do occur they start no more fires in proportion to their numbers than do rain-bringing thunderstorms. This is because the lightning in "dry" storms passes mostly from cloud to cloud, not many flashes striking the earth.

It is usually possible for an observer on a mountaintop to tell, even at a considerable distance, whether a lightning flash leaps from cloud to cloud or whether it strikes the earth. This is a matter of considerable practical importance, Mr. Gisborne's study indicates, for in the nonfire-starting storms 76 per cent. of all flashes were of the cloud-to-cloud variety, whereas the storms that started fires sent 44 per cent. of their lightning flashes to the earth.

SLAUGHTER OF WILD DUCKS IN EUROPE

By Dr. THEODOR AHRENS

EUROPEAN conservationists and zoologists are watching the development of America's efforts to save its wild ducks with much sympathy and considerable interest. The effort to put down the commercial exploitation of game in America is being followed especially closely, because Europe, with a smaller wild-life population and a much more intense pressure for food by the human population, has permitted a much more extensive killing of wild ducks for market purposes.

A European institution that has no American counterpart is the commercial decoy pond. Decoy ponds are bodies of water to which ducks are attracted, sometimes with the additional lure of food. On their shores are structures of various types which serve as traps. The ducks lured into them, leave only as carcasses headed for

the market. The annual drain of these ponds on the European wild-duck population is a serious one.

In Germany there are at present eleven decoy ponds, in Belgium there are four, but the average is not stated; England has twenty-one such ponds but the average kill is only about 600; the English use the ponds as a sport, not for gain!

Holland has the greatest number of ponds, the number of the catch of which has been, until recently, suppressed in the interest of the Dutch canning industry, which takes the catch and has built up a profitable export trade thereon. Now, at last a Dutch ornithological organ has published a statement. There are, according to it, 145 ponds in Holland, most of which are in the provinces of Gelderland, South Holland, and North Brabant. The average annual catch is 300,000 ducks.

The open season lasts from July 27 until February 14, sometimes even until March 13. The bands or banded birds have shown that the majority of the ducks caught in Holland come from Scandinavia and Finland. In the long run the supply will unquestionably become diminished at the present rate of destruction.

It is obviously well-nigh impossible at present to expect much remedy, as the Dutch Government is unwilling to interfere with a profitable home industry; yet if the open season were only somewhat shortened some relief would ensue. An effort will therefore be made at the coming International Conference to bring about certain changes in the Paris Bird Protection Convention of 1902, to reduce the open season to a period lasting from September 15 to January 31.

ITEMS

BUTTERFLIES' legs contain the insects' organs of taste, and they are far better than the human tongue for detecting the presence of sugar. At the University of Minnesota, Dr. Almeda Louise Anderson has been experimenting with a number of butterfly species, testing each for the most dilute solution of common sugar that would make it extend its proboscis. The taste "threshold" for different butterflies, or even for the same individual at different times, varied a good deal; but the most sensitive tasting legs were found finally on a common red-and-black monarch butterfly. They could detect sugar in a solution 1,200 times more dilute than the weakest that would taste sweet to a human tongue. A full statement of Dr. Anderson's results is to be published in The Journal of Experimental Zoology.

GALL-FLIES flew in the Miocene, back in the times when wild camels and three-toed horses scampered in the country that is now Oregon. This is indicated by an interesting fossil oak leaf that has been studied by Arnold D. Hoffman, of the University of Chicago. Split out from between layers of shale, the leaf impression shows 25 flattened-down swellings closely resembling the hypertrophied growths caused on leaves and stems of present-day plants by the little wasps called gall-flies, who lay their eggs in plant tissues to give their young grubs an abundant food supply.

THE First Autoclave with the Eclipse Door. Originated in 1900 and developed to keep pace with the advances of laboratory technique.

Authorized dealers everywhere



BRAMHALL, DEANE CO.

Established 1859

51 East 21st Street

NEW YORK

SCIENCE

A weekly journal, established in 1883, devoted to the advancement of the natural and exact sciences, the official organ of the American Association for the Advancement of Science.

Annual Subscription \$6.00; single copies 15 cents.

THE SCIENTIFIC MONTHLY

An illustrated magazine, devoted to the diffusion of science, publishing articles by leading authorities in all departments of pure and applied sciences, including the applications of science to education and science. society.

Annual Subscription \$5.00; single copies 50 cents.

THE AMERICAN NATURALIST

A bi-monthly journal established in 1867, devoted to the biological sciences, with special reference to the factors of organic evolution.

Annual Subscription \$5.00; single copies \$1.00.

SCHOOL AND SOCIETY

A weekly journal covering the field of education in relation to the problems of American democracy. Annual Subscription \$5.00; single copies 15 cents.

AMERICAN MEN OF SCIENCE

A BIOGRAPHICAL DIRECTORY—Fourth Edition

This book is essential for all workers in science and is an invaluable work of reference for libraries and for all having relations with scientific men.

Price: Ten Dellars net, postage paid.

LEADERS IN EDUCATION

A biographical directory of leaders in education along the lines of American Men of Science. This directory contains over 11,000 names.

Price: Ten Dollars net, postage paid.

THE SCIENCE PRESS

Grand Central Terminal, New York, N. Y.

Increase Efficiency with Kewaunee Laboratory Furniture

As schools become more congested and the question of new buildings becomes a serious consideration, school authorities should make every effort to increase the efficiency of science rooms. Kewaunee Laboratory Furniture offers the solution. It accommodates more students



SCO

Physics Table No. B-204

in space provided, offers handy, working facilities and is pedagogically correct. If your school is crowded, write us to send a Kewaunee Engineer, at no cost to you, to study your furniture prob. lem and to make suggestions for increasing capacity of Science Rooms.

reunumees

C. G. Campbell, Pres. and Gen. Mgr. 115 Lincoln St., Kewaunee, Wis.

Chicago Office: 14 E. Jackson Blvd.

New York Office: 70 Fifth Avenue

Offices in Principal Cities

The Foundations of Science

By H. POINCARE

Pp. xi + 553.

Containing the authorized English translation by George Bruce Halsted of "Science and Hypothesis," "The Value of Science" and "Science and Method," with a special preface by Poincaré, and an introduction by Josiah Royce. Price, postpaid, \$5.00.

THE SCIENCE PRESS

Grand Central Terminal

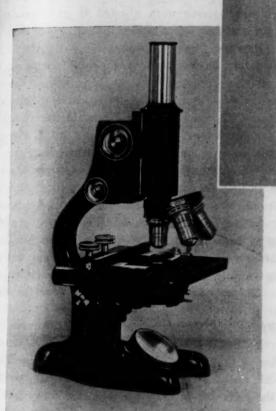
New York, N. Y.

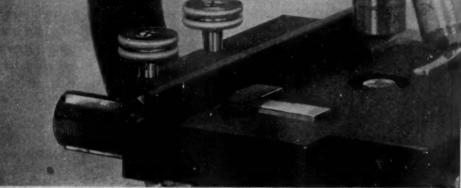
A NEW MECHANICAL STAGE

... Greater Convenience for Scientists.

THE mechanical stage offered to the scientist for it brings a conscope FFSB is of especial interest more expensive instruments.

with the new B & L Micro- venience heretofore found only in





The improved design of the mechanical stage gives a firmness and stability comparable to research instrument specifications. The special holder keeps the slides firmly against the stage surface under all conditions. The smoothness and precision of movement of this stage multiplies the ease of specimen manipulation.

A special feature of this new mechanical stage is the extra long rack which allows systematic examination of 2" x 3" slides instead of the usual 1" x 3" size.

The stage and microscope are handsomely finished in black and stain proof chromium. Equipped with rack and pinion substage and divisible Abbe Condenser. Optional optical equipment provides for work in a wide range of magnifications.

Send the coupon for complete details

BAUSCH	&	LOMB	OPTICAL	COMPANY
642 St. Paul Str	eet		P.	ochester New Vork

on That Bucct	Rochester, New 101	17.
Please send me complete details of the FFSB Microscope	and Accessories.	
Name		
Address		
City		

AUG

prol

or d

diab

diab

diab

burn

over

ably

beti

ing

ear

is b

gen

figt

Ch

rec

blo

of

cis

ph ar

ea

g

th

it

be

le a w

8 00 8

T

SCIENCE NEWS

Science Service, Washington, D. C.

POLAR YEAR STATIONS

Investigators of thirty-three nations are taking their posts at more than 100 observing stations scattered over the earth to begin thirteen months of intensive scientific work. About half the stations are permanent and have been in operation for years; the other half are being set up for this Second International Polar Year and many of them are on sites of First Polar Year Stations operated fifty years ago.

But for the coming work, Polar Year is a misnomer. Roughly 40 of the 100 stations will be in the Arctic, above the 55th parallel, and a few will be in the Antarctic, while the rest will be scattered over the warmer parts of the earth.

Participation of the United States will be manifest in the establishment of an important observing point at the village of College, near Fairbanks, Alaska. It had been hoped that Fort Conger, on Ellesmere Island, northeast of Canada, could be occupied again through private subscription, but lack of funds prevented the carrying out of this project. Observations were made from Fort Conger by the ill-fated Greely Expedition during the First Polar Year. The station near Fairbanks, however, will be an important one at which special observations are to be made.

Among the latest expeditions to take to the field are one from France and another from Denmark, which will set up stations in Greenland. University of Michigan scientists, under Professor Ralph L. Belknap, have also left for Greenland. On this, their fifth expedition to the continent of ice, they will continue studies of air currents and ice.

A Danish investigator, who has reached Cape Town, is carrying instruments with which he will set up stations in South Africa and Madagascar, according to information received by Director J. A. Fleming, of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington. Additional observations will be made in the far south from an Argentine station in the Orkney Islands and from a post which Chile has promised to put up in the southern part of South America.

Polar Year officials hope to cooperate with the second Byrd Antarctic Expedition which, it is expected, will occupy stations in the Antarctic continent during 1933.

While the northern stations are scheduled to begin operations in August of this year, those in the far south will wait until summer comes to that part of the world, and January has been set as their opening month.

CANCER CELLS AND NORMAL CELLS

THE discovery of a positive difference between the cells that make up cancers and healthy cells that occur normally is reported from the Kracow (Poland) Institute of Pathology by Dr. Z. Zakrzewski. There is hope that 'the understanding of cancer will be aided by this discovery.

When the multiplication of a cancer cell is prevented, Dr. Zakrzewski finds that it fails to exhibit any differentiation in structure, while when a normal cell is treated in the same way, it changes its structure.

The cancer cell is a sick cell in the sense that some of its normal functions are altered or destroyed, and Dr. Zakrzewski thinks that it is this property or principle of differentiation that is lacking, while the property of proliferation or growth is retained. His conclusions are based upon cell-culture experiments in which bits of the cancer-tissue were allowed to grow outside the body in a suitable medium kept under proper conditions and protected from contamination and infection.

Many observers have grown cancer-cells in this way, especially in this country, and much is known about their characteristics, but so far no decisive difference has been found between them and normal cells grown under similar conditions. The differences are in degree rather than in kind, quantitative rather than qualitative. The reason for this negative result, Dr. Zakrzewski believes, lies in the fact that in the cell-culture experiments the conditions sought for and maintained are those that favor active multiplication of the cells. Growth-stimulating substances are added to the medium in the form of extracts of embryonic tissue, and when cells are multiplying rapidly they do not show differentiation in structure. There is an incompatibility between the two processes.

Dr. A. Fischer, of Berlin, has found that if heparin is added to the blood-plasma in which normal cells are being cultured their multiplication is prevented. The culture will remain for months without cell growth, although the cells are in a living condition and capable of showing differentiation in structure. If the bit of normal tissue that is being cultured was taken from an embryo it may produce cells of different kinds, such as bone, cartilage, fat and muscle.

On the contrary, if cancer cells are cultured in a heparin plasma, neither multiplication nor differentiation takes place. The fragment may lie for months without increasing in size and with no change in the structure of the cells, although it is still living and retains its malignancy. If inoculated into a living animal it grows rapidly and causes the death of the animal. It is not known what has happened to the cancer cell to cause it to lose its power of differentiation while retaining the property of unlimited multiplication, but Dr. Zakrzewski feels that he has established one definite characteristic of the cancer cell whose further study may lead to important results.

The heparin used to prevent proliferation in the cell cultures is a substance, discovered in this country by Dr. W. H. Howell, then at the Johns Hopkins University. It is obtained from the liver and it prevents the clotting of blood. Dr. Zakrzewski's report appears in the Zeitschrift für Krebsforschung.

DIABETIC ANIMALS MAY BURN FAT INSTEAD OF SUGAR

EXPERIMENTS showing that sufferers from diabetes probably burn fat instead of sugar when they exercise or do muscular work were reported by Dr. William H. Chambers, of Cornell University Medical College, at the recent meeting of the American Association for the Advancement of Science in Syracuse.

When the pancreas fails to produce enough insulin, diabetes follows. Investigators differ as to whether the diabetic condition is caused by an overproduction of sugar from fat or is due to a loss of the ability to burn sugar, Dr. Chambers pointed out. Recent studies of diabetics during exercise have seemed to show that they burn some sugar during exercise and that therefore the overproduction idea was correct. Dr. Chambers's studies, on the contrary, indicate that this theory is probably not correct and that even during exercise the diabetic is burning fat for fuel and not sugar.

The method of determining whether the body is burning fat or sugar consists of measuring the ratio of the carbon dioxide output to the oxygen intake. When fat is burned the quotient of carbon dioxide divided by oxygen is 0.71, and any rise in this figure shows that sugar is being burned.

The investigations show that there was a rise in this figure during exercise in diabetic animals, but Dr. Chambers also made measurements during the rest or recovery period following the exercise and studied the blood composition during this time. From these findings he concluded that the rise in the figure for the diabetic during exercise is due to change in the acid-base balance of the body and not to the burning of sugar, and that consequently the diabetic burns fat for fuel during exercise as well as when at rest.

THE USES OF TEAR GAS

Some people decry the use of gas in warfare as wantonly destructive and unhumanitarian. But the little blue can filled with tear gas, chemists call it chlo-ra-cet-ophe-none, did practically without injury what bayonets and bullets could have accomplished only with a heavy casualty list when the bonus marchers were driven from government property.

Chloracetophenone itself was not developed until near the close of the war, but other harmless gases similar to it were used to harass troops on the battlefront. Brombenzyl cyanide is one.

Their effects are familiar. Sharp pains stab the eyes causing them to water so that temporary blindness follows. The most menacing mob cries and flees. Fresh air is a sure remedy, but for more immediate comfort wash the eyes with boric acid solution, a publication of the U. S. Chemical Warfare Service advises.

These discomforts soon pass and the effects of the gas are over. Yet, a person could commit suicide with the gas if he would lock himself in a tight room and explode several bombs. He would die of asphyxiation, a result that could be achieved more economically with smoke. The bonus veterans reported to have been treated for gas

burns must have received their injuries from hot tin as they picked up the cans to hurl them back at the police.

The chloracetophenone is in solid form in the cans, and, since it does not readily turn into gas, it is mixed with smokeless powder. There is not enough powder to tear the can to pieces, but just enough to blow out weak plugs so that the chloracetophenone can escape when it is changed into a gas by the burning of the powder. The explosion, delayed by a time fuse, is started when the ring is pulled and the missile hurled.

This is the tear gas bomb with which police of many cities have been equipped during the past few years. The Army calls its weapon a "CN" can. Such bombs can be bought from chemical manufacturers.

Though this weapon has been available since the close of the war, its extensive use by police is confined to the past six or seven years. Had tear gas been used in the Boston police strike of 1921, chemical warfare authorities believe that the trouble would have been much more quickly and amicably settled with less loss of life.

The manufacture of chloracetophenone is not an involved process. Acetic acid, familiar in vinegar, is made to react with chlorine, the first war gas, to form monochloracetic acid. Monochloracetic acid is in turn chlorinated to form chloracetyl chloride which is treated with benzene in the presence of anhydrous ammonium chloride to yield the desired tear gas solid.

BLIMPS EQUIPPED FOR GROUND COMMUNICATION TESTS

ONE of the vital subjects of airship navigation, radio communication, is being studied exhaustively at Goodyear's blimp base at Wingfoot Lake, Akron, Ohio, where a new station, designated as WAXQ, was recently established.

Five Goodyear blimps have been equipped with both sending and receiving apparatus for tests, and engineers hope to be able soon to announce dependable two-way communications between these small airships and the lake station for a distance of 250 to 300 miles at least.

Although the receiving range of the blimps' set-up is practically unlimited, their transmission reaches only about 200 miles in the day time. Their night transmission range is approximately 2,000 miles, however.

The new station is equipped with a four-panel transmitter. It is believed to embrace the only experimental station in existence having the recently developed system of modulation in which half of the current is conserved while the operator is not broadcasting.

The station's set-up embraces modulator and power units, an oscillator, and intermediate and power amplifiers. It is powered to transmit by voice and code for 1,000 miles in the day time and 5,000 miles at night.

Engineers are working on a special antenna for the dirigibles, since it was found that reception was greatly improved when the ships were turned in a certain direction. Shields are also being developed to prevent motors of the ships from interfering with communication activities.

A principal object of experiments is to enable airships

AUG

constantly to have available the latest observations of weather bureaus—to permit pilots to inquire regarding weather likely to be encountered along any given sky lane. Necessity of perfect communication between government aircraft and ground bases is likewise important. Buses in which ground crews travel about the country to land the blimps are next to be equipped with powerful but compact radio sets.

SKELETONS IN AN OHIO MOUND

ELEVEN skeletons of mound builders and numerous articles reflecting the prehistoric age are the discovery announced by Dr. Emerson F. Greenman, curator of the Ohio State Archeological and Historical Society, who directed the excavation of a large mound at Pippin Lake, near Akron. The excavation required a week.

The excavations ended when the eleventh skeleton, the first full-sized one, was found. Dr. Greenman pronounced the bones those of a woman who had probably been interred more than 600 years ago. The skeleton was intact except for the skull, for which only a layer of mica appeared. It was lying on its side with knee bones drawn up. Dr. Greenman declared it the first skeleton he had found lying in flexed position in any Ohio mound of the Hopewell type of culture, outside of those in the southern half of the state.

A grave uncovered in the digging, a pyramid built of flat stones, is to be reconstructed for display in the society's museum on the Ohio State University campus.

Dr. Greenman said that careful measurements would be taken of burial discoveries to ascertain whether a connecting link existed between the prehistoric moundbuilding Indians and the Western Reserve Indians.

Other discoveries at the mound included copper and shell beads, slate ornaments, arrowheads, stray teeth and portions of skulls, flint knives, and what may prove to be a petrified pipe bowl. The shell beads may have been brought from Mexico, but on the other hand could have been constructed of mussel shells of Ohio streams. The mound is about 40 feet in diameter. It overlooks what Dr. Greenman said was the ideal country always selected for mounds of the same type. The curator will announce further conclusions after intensive study of the discoveries.

ITEMS

Depredations of bacteria which thrive at temperatures that kill most of their fellows have been reported to the American Chemical Society by William L. Owen, of Baton Rouge, Louisiana. They are the thermophile bacteria, and their spores are often found in one of the purest substances used in industry, sugar. Non-acid vegetables, particularly corn, are often spoiled by the thermophiles because they flourish between 130 and 160 degrees Fahrenheit. Below 130 degrees most of them enter the spore state and do not reproduce. Mr. Owen's studies show that sugar becomes infested with thermophile spores chiefly from starch and new towel bagging in the refinery. He said that it is possible to protect sugar thoroughly during the refining process and that

some refineries are already doing this to produce for canners a more desirable product than sugar whose thermophile content is unknown.

A curious species of frog which can fly, or, to be more accurate, glide through the air by spreading their elongated hind legs, thus coming gracefully to earth from heights of as much as 90 feet, is among those found in the tropical forests of Mexico by Dr. Remington Kellogg, of the U.S. National Museum and described by him in a Smithsonian Institution report just issued. These tree frogs are difficult to find, for they keep out of the way of the human explorer and can even change the color of their bodies like chameleons to match their surroundings. Various members of the family of tree frogs show different stages of evolutionary adaptation to their home in the trees. Besides the "flying" species, there is another which is learning to climb and cling to limbs of trees through the development of adhesive disks on the ends of the fingers and toes.

FIRE-SWEPT ruins of a house containing timbers cut in the year 797 A. D. have been discovered at an Indian site near Allentown, Arizona, is the report just received at the Bureau of American Ethnology from Dr. Frank H. H. Roberts, Jr., of its staff. The house takes rank as the oldest dated ruin in the Southwest. The house was a pit house, built largely under ground, with an entrance through the roof. Such homes must have been fire-traps. The fire which destroyed the place forced the inhabitants to flee without salvaging their belongings. Dr. Roberts found everything still inside, including much pottery. Antiquity of the house was determined by means of four timbers on the floor. The dates of the tree rings were read according to the tree-ring calendar worked out by Dr. A. E. Douglass, of the University of Arizona. Dates previously established as the oldest in the Southwest were 919 A. D. from a beam found at Pueblo Bonito, then 861 A. D. from a piece of timber in Una Vida, both pueblos being in New Mexico.

OVER three hundred pounds of the rare chemical element rhenium will be made available for industrial use each year by the utilization of a waste material from a Mansfeld copper ore, the German correspondent of the American Chemical Society reports. Rhenium was discovered in 1925 by Drs. Walter and Ida Noddack, husband and wife, Berlin chemists, and it is element 75 in the table of atomic numbers. The first gram (less than a thirtieth of an ounce) of the metal cost the discoverers some \$12,500 to produce. Dr. Wilhelm Feit, of a chemical concern at Leopoldshall, Germany, tested the schist waste for rhenium because it contained molybdenum, an element with which Drs. Noddack found rhenium associated. Although the molybdenum-bearing waste contains only two parts rhenium in ten million, Dr. Feit has extracted the rare element from it successfully.

L253 QUARTZ SPECTROGRAPH



L253

THIS type of Spectrograph provides a high resolving power and intensity in the visible and ultraviolet regions. It is particularly recommended for metallurgical research and routine quantitative analysis by the raies ultimate method. Every detail has been carefully designed to give permanent accuracy. The instrument is constructed entirely of metal and is mounted on an iron base two meters long. The metal cover is removable by sections giving easy access to the optical parts. The spectrum is photographed in three sections from 200 to 800 Mu Mu on 10" x 2\frac{5}{5}" photographic plates. Three plate holders are included.

Complete details sent on request.

THE GAERTNER SCIENTIFIC CORP.

1201 Wrightwood Avenue.

Chicago, U.S.A.



For Melting or Heating.

Made in sizes for Laboratory

Tests

and for

Commercial

Production

Write for information

Ajax Electrothermic Corporation

G. H. Clamer, President & Gen. Mgr.

Trenton, New Jersey
lamer,
Gen. Mgr.

E. F. Northrup,
Vice Pres. & Technical
Adviser

Cook

Hydraulic **High-Pressure Pumps**

for pressures up to 500, 6,000, 10,000, 22,500, 75,000 lbs. per sq. inch.

For high-pressure gas research. Various types to meet all requirements.

> Write for details, explaining your individual needs.

HERMAN A. HOLZ

Complete Line of High-Pressure Research Equipment for Gases and Liquids.

167 East 33rd St.

New York

AUGU

patch

result

Amer

of th

to X-I

anest

earef

each

matte

parer

patch

Af

almos

abou

state

that

from

mobi

is no

gests

The

the

nen

men

T

stitu

and

staf

C. 1

tens

leng

mea

equ

med

twe

fro

sur

the

whi

1

x-u

rad

5

X-I

use

mo

me

rei

at

Se

mi

to

hu

W

SCIENCE NEWS

Science Service, Washington, D. C.

THE EARTH'S GREATEST WATERFALLS

Two "fossil Niagaras" once roared in the Grand Coulee, a deep, wide gorge that lies about half-way between Spokane and Seattle. These extinct cataracts, now represented only by lines of towering dry cliffs, have been studied by Professor J. Harlan Bretz, of the University of Chicago, who has presented his report on them to the American Geographical Society.

The water that fed these two great cataracts came from melting glaciers of the great Ice Age. Creeping down from the north, the ice had for ages blocked the course of the Columbia River. As the glaciers began to melt off and retreat, they released immense quantities of water, which had to find a new watercourse. Of this necessity of nature was born the Grand Coulee, whose bed, now dry except for a chain of small lakes, is a thousand feet deep, with a width of a mile at its narrowest point. It has a total length of about fifty miles, with an interruption in the cliff walls somewhat more than half-way down its course dividing it into an Upper and Lower Coulee.

The bottom of the Grand Coulee is not a fairly even slope, as the bottom of an ordinary river valley would be. It has humps and irregularities, and in the rocky floor there are enormous "potholes" a hundred feet deep. Potholes—steep-sided, round-bottomed holes in solid rock—are formed in only one way: by the grinding and pounding of boulders kept in motion by the force of falling water.

Professor Bretz therefore looked for the remains of a waterfall that might have done such cyclopean sculpturing. He found two, both of tremendous proportions.

The lesser of the two falls was at the head of the Lower Coulee. It formed a group of cataracts, rather than a single fall; but when the enormous length of its great "horseshoe" and all the lesser bendings of the remaining cliffs are measured as a straight line, the total comes to some three and a half miles, or nearly six times the straight-line width of Niagara Falls. This tremendous stream leaped from the crest of a 400-foot cliff, more than double the height of Niagara, and substantially higher than Victoria Falls in Africa, the greatest known existing cataract.

But mighty as these falls in the Lower Coulee were, they were surpassed by the Steamboat Cataract of the Upper Coulee. This feature gets its name from a high outstanding rock in front of the cliff. It was once an island, first on the brink, as Goat Island stands on the brink of Niagara to-day, then left isolated as Goat Island would also be if the American and Horseshoe Falls receded at equal rates.

The Steamboat Cataract was a good mile wider than the falls system of the Lower Coulee, and more than twice as high. In the days of the late Pleistocene, the waters roared over its cliff in a plunge of nine hundred feet!

All this super-Niagaran magnificence vanished when

the receding glacial front retreated far enough for the water to flow down the present course of the Columbia River, leaving the upper end of the Coulee high and dry. The head of Grand Coulee now stands about 500 feet above the water-level of the river, and several miles removed from its course.

PITUITARY GLAND SECRETION AND MILK PRODUCTION

Milk was produced in the mammary glands of experimental animals—even including males—when a newly isolated extract of the anterior lobe of the pituitary gland, considered to contain a new hormone which has been named "prolactin," was injected into their bodies. The experiments leading to this result, which is expected to have much clinical importance, were performed at Cold Spring Harbor by Dr. Oscar Riddle, Dr. Robert W. Bates and Simon W. Dykehorn, of the department of genetics of the Carnegie Institution of Washington. The same hormone also causes the production of pigeons' "crop milk," with which they nourish their young.

The anterior part of the pituitary gland, a small body nestling on the under side of the brain, has already been shown to produce two important hormones or internal secretions. One of these is important in governing the body's growth rate, while the other stimulates the activity of the sex glands. The importance of the pituitary gland in the production of milk was already known, but it had been assumed that one of the two hormones already discovered was responsible for this, and only the finding of the new third hormone has brought about a change in this belief.

Female guinea-pigs and rabbits, injected with prolactin, began the production of milk immediately. The secretion of milk in the mammary glands of male guinea-pigs was made possible only after the animals received a preliminary injection of another hormone derived from the sex-glands of female animals which stimulated their development.

These new results were greatly facilitated by the earlier studies of Dr. Riddle and Miss Pela Fay Braucher, who found, a year ago, that the crop-gland of pigeons forms and functions under the influence of some substance produced in the anterior pituitary gland. In the present studies it was soon learned that neither of the two earlier known pituitary hormones had the slightest effect on the crop-gland, so that this structure provides a quick and definite test for the presence of prolactin in any extract or chemical fraction of the pituitary gland.

DEVELOPMENT OF PIGMENT UNDER X-RAYS

GOLDFISH have been given x-ray tests to shed light on the little-understood subject of the cause of the formation of pigment-carrying cells in man and lower animals. In man, these pigment-carrying cells erupt in the skin, forming unsightly dark blue patches. Sometimes these patches are birth-marks, sometimes acquired later, as the result of injuries or irritations.

Results of the goldfish experiments are reported to The American Journal of Cancer by Dr. George Milton Smith, of the Yale University School of Medicine. In order to x-ray only one side of forty-seven lively fish, Dr. Smith anesthetized his small subjects. After five or six days of carefully regulated x-ray treatment, the exposed side of each fish began to erupt tiny cells carrying dark coloring matter. These made splotches of black under the transparent outer skin of the fish, and formed interlacing patches against the dark red bodies of the fish.

After the treatments, the dark patches remained for almost two weeks and then took from eleven days to about a month to disappear, leaving the fish in the same state as before the experiment—except for four subjects that were so acutely affected that they died, apparently from a secondary infection.

Why x-ray exposure causes goldfish to respond by mobilizing these dark, color-carrying cells in the skin, is not yet clear, Dr. Smith reports. There is, he suggests, some connection with repair and defense processes. The whole matter is important to physicians because of the possible connection of the formation of these pignent cells or melanophores with the development of pigmented tumors.

A MILLION VOLT X-RAY TUBE

THE new million-volt x-ray tube of the California Institute of Technology is now being operated regularly and at a potential up to 1,200,000 volts. The research staff in charge of the large tube, headed by Dr. Charles C. Lauritsen, has made careful measurements of the intensity of the radiation produced and the limit of the length of short-wave radiation has been determined by means of a specially designed crystal spectrograph.

In quality of radiation produced, the million-volt tube equals many times the amount of radium available for medical use in the world at present, the intensity being twenty roentgens at a distance of seventy centimeters from the target. This is equivalent, according to measurements made at the New York Memorial Hospital, to the raying power of at least two kilograms of radium, which would cost at present prices about \$120,000,000.

The shortest wave-length radiation produced is twelve x-units, which is less than most of that produced by radium.

Some research is now being done on the effects of the x-rays from this tube upon animals. The tube is to be used especially for biological work.

The million-volt tube is essentially a large and much modified edition of the conventional x-ray tube used in medical radiology, but is operated with alternating current. In this it differs from tubes of lower voltages at the Memorial Hospital in New York City and at Schenectady. To supply the tube with current at a million volts potential, large transformers were built to order. These deliver sufficient current to light three hundred 100-watt lamps.

ITEMS

THE high temperatures of 1931, warmest year on U. S. Weather Bureau records, still persist, but not to the

sweltering extent of the record year. "Temperatures so far during 1932 have had a general tendency to range above normal, though not markedly so most of the time," said J. B. Kincer, chief of the division of agricultural meteorology of the U. S. Weather Bureau. "Only one month, March, had decidedly sub-normal temperatures while three months, January, February and July, were abnormally warm over much of the country. January and February, however, were decidedly cold west of the Rocky Mountains, and July had nearly normal warmth over a large area. Moderate temperatures tending to be somewhat warmer than normal were recorded for the other three months, April, May and June."

Borelly's periodic comet, an occasional visitor to the neighborhood of the sun, was sighted by Dr. George Van Biesbroeck, of Yerkes Observatory, early on Saturday morning, July 30. The information was forwarded to the American clearing house for astronomical news at Harvard College Observatory. When first observed, the comet was of twelfth magnitude, far below naked-eye visibility, and had no tail. Its position, in the astronomical equivalents for latitude and longitude, was right ascension 5 hours 31 minutes 54.7 seconds, declination plus 13 degrees 2 minutes 13 seconds. This puts it in the neighborhood of the zodiacal constellation Taurus, the bull, near the very bright star Aldebaran.

THE ancient lady of Lloyd's, the skull previously famed as the oldest Londoner, has become the oldest known true human being of the species Homo sapiens. She was so pronounced by Professor G. Elliot Smith, British anthropologist, speaking at the congress of prehistoric and protohistoric sciences. Professor Smith finds the Lloyd's skull, discovered in 1925, is modern in type but probably contemporary with early Mousterian times and therefore by many thousands of years the oldest known Homo sapiens. The skull when first found was assigned to the late Stone Age or upper paleolithic period and Professor Smith's new pronouncement probably more than doubles its previously accepted age of about twenty thousand years. Homo sapiens is the species to which the existing races of men belong. The Neanderthal race is widely found and known from skeletons that have been excavated in Europe. These ancient men lived in Mousterian times, contemporaneously with the race represented by the Lloyd's skull.

Exposure to the fumes of sulphur dioxide, used commonly as a refrigerant, does not constitute a health hazard to workers, in the opinion of Drs. Robert A. Kehoe, Willard F. Machle, Karl Kitzmiller and T. J. LeBlanc, of the University of Cincinnati, as reported to The Journal of Industrial Hygiene. After a study of one hundred men who had worked in the fumes for varying periods, some as long as twelve years, it is concluded that frequent and more or less continuous exposure to endurable amounts of the fumes causes no permanent damage to the system, and that the effects of exposure to unendurable concentration under conditions which allow of quick escape are negligible.

BI

them

time. A

each

Subs

Abst

tion

head

cards Price

At

bled

and

Libe vice

The

THE First Autoclave with the Eclipse Door. Originated in 1900 and developed to keep pace with the advances of laboratory technique.

Authorized dealers everywhere

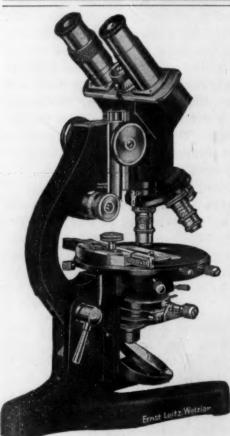


BRAMHALL, DEANE CO.

Established 1859

51 East 21st Street

NEW YORK



eitz

Microscopes for all purposes.

Micro

Projectors. Microscopical

Lamps.

Metallurgical Equipment.

Grinding - Polishing and Rock Cutting Machines for thin sections.

Projection A pparatus for Opaque Objects and Lantern Slides.

Leica Camera and Film Slide Projectors.

Expert repairing of Microscopes

SPINDLER & SAUPPE, INC.

Western Representatives

SAN FRANCISCO 86 Third St.

LOS ANGELES 811 West Seventh St.

SPACE SAVING

Laboratory Furniture by Kewaunee



Lincoln Science Desk No. D-503

Laboratory classrooms of 10 years ago are today inefficient compared to the modern space-saving furniture now built by Kewaunee. If your school wishes to make science classes available to more students or to add another science course, perhaps the refurnishing of present rooms with Kewaunee space-saving furniture will make such plans possible.

Write for the Kewaunee Laboratory Furniture Catalog, or ask for the Kewaunee Engineer. He comes at no expense to you and gives reliable, expert advice.

SECULIARIZED SURNITURE FURNITURE DEXPERTS

C. G. Campbell, Pres. and Gen. Mgr. 115 Lincoln St., Kewaunee, Wis.

Chicago Office: 14 E. Jackson Blvd.

New York Office: 70 Fifth Avenue

Offices in Principal Cities

BIOLOGICAL and NATURAL HISTORY MATERIAL



Zoological Groups **Embryological Slides** Life Histories **Botanical Drosophila Cultures**

Catalogs on request: Address

MARINE BIOLOGICAL LABORATORY

Supply Department

Woods Hole, Mass., U. S. A.

APPARATUS and REAGENTS

FOR LABORATORIES OF CHEMISTRY and BIOLOGY

Our new 1044-page catalogue illustrates and describes 11,814 Apparatus items and lists 2,762 Reagent items, all controlled in quality, currently priced and stocked for immediate shipment.

ARTHUR H. THOMAS CO.

WEST WASHINGTON SQUARE

PHILADELPHIA, U. S. A. Cable Address, BALANCE, Philadelphia

in-

ire

ke

dd

of

THE WISTAR INSTITUTE BIBLIOGRAPHIC SERVICE

AUTHORS' ABSTRACTS

f all papers appearing in the journals listed below prior to publication of the articles in full. By this advance information biologists may familiarize themselves with contemporary research in a minimum of

Advance Abstract Sheets are issued twice a month,

each sheet containing ten or more authors' abstracts. Subscription rate is \$3.00 per year.

Bibliographic Service Cards, following the Advance Abstract Sheets, also are issued twice a month. In additional contents of the service of tion to the authors' abstracts, the cards provide subject headings and complete bibliographic reference. The cards are convenient for filing and library records. Price, \$5.00 per year.

At regular intervals the authors' abstracts are assembled and published in book form with complete authors' and analytical subject indices. Price, \$5.00 per volume. Liberal discount to subscribers to the Bibliographic Service Cards.

JOURNAL OF MORPHOLOGY JOURNAL OF MORPHOLOGY
THE JOURNAL OF COMPARATIVE NEUROLOGY
THE AMERICAN JOURNAL OF ANATOMY
THE ANATOMICAL RECORD
THE JOURNAL OF EXPERIMENTAL ZOÖLOGY
AMERICAN ANATOMICAL MEMOIRS
AMERICAN JOURNAL OF PHYSICAL ANTHROPOLOGY
JOURNAL OF CELLULAR AND COMPARATIVE PHYSIOLOGY
FOLIA ANATOMICA JAPONICA (Tokyo, Japan)
PHYSIOLOGICAL ZOÖLOGY (Chicago, Illinois)
STAIN TECHNOLOGY (Geneva, New York)
ECOLOGICAL MONOGRAPHS (Durham, North Carolina)

The Wistar Institute of Anatomy and Biology Philadelphia, Pa., U. S. A.

A HISTORY OF WOMEN'S **EDUCATION IN THE** UNITED STATES

By THOMAS WOODY

Professor, History of Education, University of Pennsylvania

1338 pages Price \$10.00

"While we have modern histories, political, philosophical and educational histories, we still lack one that duly takes into view the education of women."

THE SCIENCE PRESS

GRAND CENTRAL TERMINAL NEW YORK, N. Y.

LANCASTER, PA.

Just Published

Flora of the Prairies and Plains of Central North America

BY PER AXEL RYDBERG, PH.D.

This cloth-bound volume contains 969 pages, with 601 text-figures. It includes descriptions of 177 families, 1066 genera, and 3,988 species, keys to all groups, with glossary, list of author abbreviations and index. It aims to describe all of the native and naturalized species of ferns, fern-allies and seed-plants of Kansas, Nebraska, Iowa, Minnesota, South Dakota, and of parts of Illinois, Wisconsin, Missouri, Oklahoma, Colorado, Wyoming, Montana, Manitoba, and Saskatchewan.

Price \$5.50, postpaid

Address The New York Botanical Garden Bronx Park (Fordham Station) New York, N. Y.

NEW (15th) EDITION OF

THE MICROSCOPE

By SIMON HENRY GAGE

Revised throughout, and a wholly new chapter on the Ultra-Violet Microscope. Price, \$4.00.

THE COMSTOCK PUBLISHING CO, Ithaca, N. Y.

Second Edition: Revised and Enlarged THE RAT: DATA AND REFERENCE TABLES

Memoir No. 6: 458 pages. Bibliography: 2206 titles

HENRY H. DONALDSON

Published by THE WISTAR INSTITUTE

Philadelphia, Pa., U. S. A.

Price, \$5.00

The Rat: A bibliography, 1924-1929.

L. E. DRAKE and W. T. HERON

1353 titles-with subject index.

Price-50 cents

Orders may be sent to

The Wistar Institute, 36th Street & Woodland Ave., Philadelphia, Penna.



Field Equipment for Engineers,

Explorers, Hunters, Travelers
Scientific Instruments, Packing Equipment,
Skis, Firearms, Clothing, Fiala Pat. Sleeping Bags, Optical Instruments, Astronomic
Telescopes, Range Finders, Binoculars.
Paulin Altimeters. Write for Catalog "A."
FIALA OUTFITS

47 Warren St., New York

su

T

SCIENCE NEWS

Science Service, Washington, D. C.

NOTES ON THE ECLIPSE

INVESTIGATORS of the U.S. Bureau of Standards will make extensive studies of the radio effect of the eclipse of the sun on August 31. From a field location either in northeastern Maine or eastern Nova Scotia and simultaneously from the permanent laboratories at Washington, physicists and radio engineers under the direction of Dr. J. H. Dellinger will record the effects of the eclipse on the field intensities of received radio waves and on the height of the ionized or Kennelly-Heaviside layer. The Washington location is expected to be very satisfactory for studies of changes in the ionized layer due to the optical eclipse as it is nine tenths total at the earth's surface and somewhat nearer totality in the ionized layer above Washington. The purpose of the observation in Maine or Nova Scotia is to test for the existence of effects in the ionized layer due to neutral corpuscles shot off from the sun, Three members of the Bureau of Standards staff will take to Maine or Nova Scotia two small pulse-signal transmitters and an automatic recorder and a cathode-ray oscillograph for measuring ionized layer heights. They will also observe the critical frequencies and heights of both the E and F regions of the ionized layer. In order to help interpret the records obtained during the eclipse, observations will be made for several days preceding and following the eclipse. Records of field intensities of received waves from broadcasting stations, and possibly from a high-frequency station, will be made both at Washington and on the eclipse expedition.

DR. IRVING LANGMUIR, of the General Electric Company, will observe the eclipse from an airplane starting from Concord, N. H., in time to reach the center of totality at the time the moon hides the sun. As Dr. Langmuir's airplane will be equipped with instruments for fog flying, he will be able to rise above any clouds that may obscure the spectacle from the ground. Two motion picture cameras, one with telephoto lens, will be carried and Dr. Langmuir will photograph the advance of the moon's shadow and take photographs of the corona.

Dr. CLYDE FISHER, curator of astronomy of the American Museum of Natural History, will photograph the eclipse from an airplane flying in the path of totality in Maine.

THE eclipse expedition of the Maria Mitchell Observatory on the Island of Nantucket will be located on August 31 on a 250-foot tower at North Truro, Cape Cod, as guests of H. M. Aldrich. Dr. Margaret Harwood, director, will lead the party consisting of Miss Marjorie Williams, Mrs. Francis W. Davis, Miss Merle E. Turner, Albert E. Brock, Edgar F. Sanborn, Jr., Gerald M. Reed, Jr., and Nathan C. Davis. The expedition will make photographs of the corona designed to study photometrically its light, using a 4-inch photographic telescope. Visual observations will be made with another telescope.

Choosing to observe the eclipse from near the edge of the path of totality, Professor Herbert Dingle, of the Imperial College of Science and Technology, London assisted by members of the McGill University staff, will make photographs of the sun's spectrum that are expected to be superior to previous efforts. On the roof of a McGill University building, a large spectroscope with lens of 16-foot focus will be mounted. The bright line spectrum at the cusp of the partially eclipsed sun during the half hour before and after totality will be photographed with large dispersion. Professor A. Fowler, a colleague of Professor Dingle, made visual observations at a partial eclipse in London twenty years ago which cause Professor Dingle to hope that the coming observations will yield more accurate values of the wave-lengths of the bright line spectrum than those now available. A photograph of the Fraunhofer spectrum of the sun's limb just before and after totality is expected to give a photograph free from the diffused atmospheric light from the center of the sun's disc.

To give astronomers observing the eclipse accurate time signals, the U. S. Naval Observatory will broadcast special radio signals from 1:55 to 2:00 p. m. and from 3:55 to 4:00 p. m. Eastern Standard Time on Wednesday, August 31, the day of the eclipse. The signals will be transmitted by NAA, Arlington, Virginia, on regular time frequencies of 113, 690, 4205, 8410, 12615, 16820 kilocycles, from Annapolis on 17.8 kilocycles, and they will be rebroadcast by WGY, Schenectady, on 790 kilocycles, and WCSH, Portland, Maine, on 940 kilocycles.

SPECIAL radio signals will be transmitted by CNRO, the Canadian National Railways station at Ottawa, to aid in the research upon the radio effect of the eclipse according to an announcement made by Dr. A. S. Eve, director of the department of physics of McGill Uni-The transmissions will be on 600 kilocycles (500 meters) from 2 to 7 P. M., Eastern Daylight Saving Time, on August 31, and for four days before and two days after the eclipse, the signals will be transmitted from 3 to 6 P. M., Eastern Daylight Saving Time. Dr. Eve suggests that radio observers in eastern United States might measure the strength of the radio signals with a suitable galvanometer attached to their receiving sets. The tests are expected to aid in understanding the way the sun affects the ionized layers of the earth's atmosphere that act as reflectors for radio waves.

THE INCREASE OF TYPHOID FEVER

TYPHOID FEVER is increasing all over the nation. More typhoid fever cases have been reported to the U.S. Public Health Service in the last three weeks than were reported at corresponding times in the last four years. Health officials think it may be due to certain laxity in sanitary procedures as a result of decreased state and municipal appropriations for such purposes.

edge

the

don,

will

ex-

f of

with

line

ring

oto-

r, a

ons

nich

va-

ths

ble.

For the week ended August 6, there were 1,119 cases reported, while during the corresponding period last year there were only 996. On July 30 of this year there were 1,091 cases, and 908 in 1931. On July 23 there were 1,294 cases, as against 751 the preceding year. This rise has occurred considerably earlier than the usual seasonal increase in the disease. Health officials do not expect the peak to be reached for another three weeks.

Typhoid fever is now one of the preventable diseases. It was originally brought under control by sanitary measures, such as proper sewage disposal, purification of water supplies, pasteurization of milk and supervision, as far as possible, of typhoid carriers. One attack of typhoid fever makes a person immune to subsequent infection and this immunity may now be given by a course of inoculations with killed typhoid germs. The U. S. Public Health Service, however, warns that this individual immunization can not take the place of organized sanitary effort to control and prevent typhoid fever.

Typhoid fever is caused by a germ, or bacillus, which enters the body through the mouth and is discharged in the body excretions. Drinking water and oysters may harbor the germs as a result of sewage contamination. The germs may get into milk and other food by means of flies or human carriers, the latter usually being healthy persons who have recovered from the disease, but still are discharging the germs.

The onset of the disease is rather gradual, with feverishness, or perhaps a chill and headache. It is often not recognized for several days. The disease causes ulcerations of the intestines. When these perforate or cause hemorrhage, death is likely to follow.

THE PROFITS OF RESEARCH

Science should receive part of the profits that result from research and new discoveries, to serve as "seed" for further research and discoveries, in the opinion of Professor Winterton C. Curtis, of the University of Missouri. He states that the traditions of his profession forbid a scientific man from taking any personal profit from patentable ideas or discoveries that originate with him; and he often has the unpleasant experience of seeing work exploited commercially to the great financial benefit of some person or firm that did nothing toward its beginning or development, while not only the investigator but also the university or research laboratory that has given him working facilities and paid his salary struggle in financial straits.

To remedy this, and to enable scientific institutions to obtain the equipment and materials needed for more efficient research, Professor Curtis recommends the organization by universities and non-commercial research establishments of holding companies, to take charge of patents issued to scientific workers. Commercial firms desiring to make use of such patents would then deal with these companies, paying cash and royalties to them, and making suitable guarantees for the protection of the scientific reputation of the worker and of his institution and for the public welfare. The institution would be represented on the board of directors of the holding company by faculty or administrative officers.

An arrangement of the kind recommended by Professor Curtis has already been set up by the University of Cincinnati, to gain for its scientific research and eventually for its general funds the financial benefits accruing from patents issued on the work of its Basic Science Laboratory. Other institutions which have made arrangements to gain for research some of the benefits of scientific discoveries by their members include the University of Wisconsin, the University of Illinois and St. Louis University Medical School.

ITEMS

A SEVERE earthquake jarred the bottom of Bering Sea north of the Aleutian Islands, on August 11, reports received by Science Service from a number of seismological observatories indicate. As calculated by the U. S. Coast and Geodetic Survey, the epicenter, or point of greatest disturbance, was in 54 degrees north latitude, 171 degrees west longitude. The time of origin was 10:24 P. M., Eastern Standard Time.

THE Peltier-Whipple comet, visible through binoculars in the northwestern evening sky, has a tail twice as long as the diameter of the full moon appears in the sky. This one degree tail is reported by Dr. George Van Biesbroeck, of the Yerkes Observatory. The head of the comet appears like a star.

ULTRA-VIOLET rays of shorter wave-length, usually regarded as harmful to living things, can not penetrate the outer coats of seeds. But those of longer wavelength, which have a stimulating effect, pass through. This has been determined in preliminary experiments by Drs. Charles A. Shull and Harvey B. Lemon in the laboratory of plant physiology of the University of Chicago. They made use of seed coats from corn, peach kernels and cocklebur seeds, stretching them out in front of the slit of a spectrograph and focusing ultra-violet rays, filtered to known wave-lengths, upon them. The fractions of the radiation that passed through were recorded on photographic plates. The results apparently indicate that seed coats protect their living contents against harmful ultra-violet radiations but let in those of stimulating effect.

ENTOMOLOGISTS of the U. S. Department of Agriculture are preparing to cooperate with the Pennsylvania Department of Agriculture and the State Department of Forests and Waters in a campaign to wipe out a newly-discovered infestation of gypsy moth in the mountains near Pittston, Pennsylvania. This insect, introduced originally from Europe, has for years been a pest in New England, and at one time threatened to wipe out some of the finest forest and park trees in that region. The present outbreak in Pennsylvania is well outside its former known range, but is causing no alarm, for there are no tree nurseries in the area affected, so that there is no danger of its being unwittingly shipped out. The infested area so far surveyed is about four by eight miles in extent, and consists principally of cutover land.

RECENT SCIENTIFIC BOOKS

which by arrangement with The Science Press are offered by G. E. STECHERT & CO., 31 East 10th St., New York to which firm orders should be addressed

MATHEMATICS—PHYSICS

Bericht weber den 8. Internationalen Kongress f. wissenschaftliche und angewandte Photographie. Dresden, 1931. Ed. by Eggert & v. Biehler. 271 ill. pp. vii + 445. \$7.20.

Dedekind, Richard. Gesammelte mathematische Werke. Ed. by Robert Fricke & Emmy Noether. (3 vols.) Vol. 3. 508 pp. \$10.47.

De Fermat, Pierre. Bemerkungen zu Diophant (Ostwalds Klassiker d. Exakt. Wiss.) 49 pp. \$-.77.

Joos, G. Lehrbuch der theoretischen Physik. Ill. 640 pp. \$6.24.

Kowalewski, Gerhard. Grundzuege der Differential und Integralrechnung. 5th ed. Ill. pp. iv + 426. \$3.46.

Lahmeyer, F. & Dorno, C. Assun. Eine meteorologisch-physikalisch-physiol. Studie. 49 plates. Ill. pp. viii + 68. \$1.44.

Neumann, Johann. Mathematische Grundlagen d. Quantenmechanik. Ill. 262 pp. \$4.70.

Reidemeister, Kurt. Einfuehrung in die kombinatorische Topologie. pp. xii + 209. \$4.56.

ASTRONOMY

Astronomischer Jahresbericht, gegr. von Walter F. Wislicenus. Mit Unterstuetzung d. Astron. Ges. hrsg. von d. Astron. Rechen-Inst. zu Berlin-Dahlem. Vol. 33: Die Literatur d. Jahres 1931. pp. xxix + 261. \$5.76.

Berliner Astronomisches Jahrbuch. Ed. by the Astronom. Rechen-Inst. Jg. 159, 1934. pp. viii + 483, \$1.44.

Deutsche meteorologisches Jahrbuch. Bayern. Jg. 53. 1931. Ill. pp. viii + 189. \$3.60.

Hoelper, Otto. Untersuchungen ueber Sonnen- und Himmelsstrahlung. 52 pp. \$1.44.

CHEMISTRY & CHEM. TECHNOLOGY

Braun, Hans J. Die Metallseifen. 83 pp. \$2.04.

Handbuch der Anorganischen Chemie. Ed. Abegg-Auerbach-Koppel. Vol. IV Abtlg. 3 Part 2. B Lfg. 2. Ill. 674 pp. \$5.76.

Herzberg, W. Papierpruefung. Eine Anleitung zum Untersuchen v. Papier. 7th ed. by Korn. 160 ill. 31 plates. \$7.68.

Jahrbuch der organischen Chemie. Ed. Julius Schmidt. Jg. 18. Die Forschungsergebnisse u. Fortschritte i. Jahre 1931. pp. xix + 346. \$9.36.

Lemmel, Hans H. Gewinnung, Veredlung und Verarbeitung der Oele und Fette. Aus d. Praxis f. Praxis u. Studium. Ill. 406 pp. \$8.16.

Mark, Hermann. Physik und Chemie der Cellulose. 145 ill. pp. xv + 330. \$10.80.

Messkin, Wenjamin. Die ferromagnetischen Legierungen u. ihre gewerbliche Verwendung. Ed. by Kussmann. 292 ill. pp. viii + 418. \$10.68.

Mueller, Robert. Allgemeine und technische Elektrometallurgie. 90 ill. pp. xii + 580. \$7.80.

CHEMISTRY & CHEM. TECHNOLOGY—Continued

Schenck, Hermann. Einfuehrung in die physikalische Chemie der Eisenhuettenprozesse. Vol. I: Die chemischmetallurgischen Reaktionen u. ihre Gesetze. 162 ill. pp. xi + 308. \$6.84.

Schlenk, W. & Bergmann, E. Ausfuehrliches Lehrbuch der organischen Chemie. Vol. I. 49 ill. pp. viii + 805, \$9.84.

Schwartz, Otto. Die technischen Werkstoffe, ihre Eigenschaften, Fehler und Pruefung. 337 ill. pp. viii + 222, \$5.88.

Spengler, Oskar. Anleitung zu Untersuchungen i. d. Zuckerindustrie. 10th ed. by Fruehling. Ill. pp. xii + 546, \$9.26.

Staudinger, Hermann. Die hochmolekularen organischen Verbindungen. Kautschuk und Cellulose. 113 ill. pp. xv + 540. \$12.48.

Tillmans, Josef. Die chemische Untersuchung von Wasser und Abwasser. 2nd ed. pp. xi + 252. \$4.56.

Winter, Fred. Handbuch der gesamten Parfuemerie und Kosmetik. Eine wissenschaftlich-praktische Darstellung d. modernen Parfuemerie einschliesslich der Herstellung der Toiletteseifen u. d. Methoden d. angewandten Kosmetik. 2nd ed. 138 ill. \$18.24.

GEOLOGY & GEOGRAPHY

Alt, Eugen. Klimakunde von Mittel- und Suedeuropa. Ill. pp. iv + 288. \$14.40.

Frebold, Hans. Grundzuege der tektonischen Entwicklung Ostgroenlands in postdevonischer Zeit. Ill. 112 pp. \$1.00.

Gutmann, Bruno. Die Stammeslehren der Dschagga. Bd. 1. pp. xv + 670. (Arbeiten z. Entwicklungspsychologie 12) \$8.64.

Hartmann, Johann. Ueber die Entstehung d. Gebirge und die Aethertheorie. Ill. 260 pp. \$2.40.

Karsten, Rafael. Indian Tribes of the Argentine and Bolivian Chaco. Ethnological studies. Ill. pp. x + 236. \$3.50.

Krogerus, Rolf. Ueber die Oekologie u. Verbreitung d. Arthropoden d. Triebsandgebiete an d. Kuesten Finnlands. 39 fig., 28 charts, 31 plates, 12 Diagr. 308 pp. (Acta zoologiea Fennica 12) \$4.32.

Teubert, Oskar. Die Binnenschiffahrt. Ein Handbuch fuer alle Beteiligten. 2nd ed. 6 charts. 377 ill. pp. viii + 1000. \$18.72.

Von Seidlitz, W. Der Bau der Erde und die Bewegungen ihrer Oberflaeche. Einfuehrung i. d. Grundfragen d. allg. Geologie. 54 ill. pp. ix + 152. \$1.15.

Wissenschaftliche Ergebnisse der Alai-Pamir-Expedition 1928. Im Auftr. d. Notgemeinschaft d. dt. Wissenschaft. Ed. by v. Ficker & Rickmers. 3 Parts in 6 vols. Parts 1-3. \$45.60.

Wuest-Boehnecke-Meyer. Oseanograph. Methoden u. Instrumente. 55 ill. 17 Autotypien auf 9 Tafeln & 5 Beil. pp. xii+298. (Wissensch. Ergebnisse d. dtsch. atlantischen Expedition auf dem Forschungs- u. Vermessungsschiff "Meteor." Vol. IV. 1) \$11.28.

STANDARD

PLUNKETT: OUTLINES
OF MODERN
BIOLOGY
\$3.75

KIMBALL: COLLEGE
PHYSICS. Fourth edition
\$3.75

CHAMBERLIN AND SALISBURY: ©OLLEGE GEOLOGY.
Revised by Chamberlin and MacClintock, Vol. I, \$3.00.
Vol. II, \$3.75. In one volume, \$5.50.

GENERAL CHEMISTRY

Revised

By Leon B. Richardson, Dartmouth College

"In my opinion it is an excellent book, one of the best texts published in the United States. The laboratory manual maintains the standard set by the GENERAL CHEMISTRY."—W. H. Barnes, McGill University

Text \$3.50

Manual \$1.50

GEOGRAPHY OF THE MEDITERRANEAN REGION

By the late ELLEN C. SEMPLE
"Perhaps the greatest study of the Mediterranean region ever written. . . A
wealth of relevant material and marvellously suggestive interpretations. . . A
truly magnificent work." The Annals

\$4.00

TEXTBOOKS

SAUNDERS: SURVEY
OF PHYSICS
\$3.75

ALTENBURG: HOW WE INHERIT \$2.40

BURLINGAME AND OTHERS: GENERAL BIOLOGY and the new GENERAL BIOL-OGY LABORATORY MANUAL

\$3.50 and \$1.25

ONE PARK AVE.

HENRY HOLT AND COMPANY

NEW YORK

A HISTORY OF WOMEN'S EDUCATION IN THE UNITED STATES

By THOMAS WOODY

Professor, History of Education, University of Pennsylvania

Two Volumes

1338 pages

Price \$10.00

"While we have modern histories, political, philosophical and educational histories, we still lack one that duly takes into view the education of women."

THE SCIENCE PRESS

-1--:--:-

GRAND CENTRAL TERMINAL NEW YORK, N. Y.

LANCASTER, PA.

Cook

High-Pressure

High-Temperature

Autoclaves

of stainless steel; with internal stirring arrangement;

various sizes, for different max. temperatures and pressures, to meet requirements

Write for details, stating your individual needs

HERMAN A. HOLZ

Complete Line of High-Pressure Research Equipment for Gases and Liquids.

167 East 33rd Str.

New York

SCIENCE NEWS

Science Service, Washington, D. C.

RADIOACTIVE DISINTEGRATION

A NEW theory of why radium spontaneously explodes and disintegrates into other chemical elements was proposed by Professor Werner Heisenberg, the young German originator of quantum mechanics and the principle of uncertainty, who lectured at the summer physics symposium of the University of Michigan.

Professor Heisenberg visualizes the heart of the atom made up exclusively of protons, the positive particles, and neutrons, the newly discovered close combinations of proton and electron. Old ideas had the atomic nucleus built of protons and electrons, but Professor Heisenberg holds there are no electrons or negative units in the atomic hearts except combined with protons to make neutrons.

He explains radioactivity by the fact that there are too many neutrons in relation to protons in the hearts of heavy elements. They are unstable. At intervals, this unstability causes a neutron to burst and out rushes an electron which is discharged from the atom as a beta particle. The proton partner of this electron remains in the nucleus. At other times the atom gets rid of mass by ejecting a bundle of two neutrons, or two protons combined with two electrons, which are equivalent to a helium heart, and smash outward in the form of an alpha particle.

This disintegration continues with radioactive elements changing into lighter ones until they reach a stable state as some lighter element. Radium in this way turns into lead.

This new Heisenberg theory provides the first satisfactory explanation of the mechanism of radioactivity. Under the Heisenberg theory the number of protons in each nucleus is equal to the atomic number, while the proton and neutrons together determine the atomic weight.

Professor Heisenberg, who came to America from the University of Leipzig especially for the University of Michigan lectures, will publish the details of his theory in the Zeitschrift für Physik.

THE STRUCTURE OF THE ATOM

COBALT of atomic weight 57, manganese of atomic weight 53, and vanadium of atomic weight 49 are predicted in a letter to *Nature* by Dr. James H. Bartlett, Jr., young American physicist and fellow of the National Research Council, through the use of a new theory of atomic structure in which neutrons and protons only are used as building blocks of the nucleus.

The normal atomic weights of cobalt, manganese and vanadium of the sorts now known are 59, 55 and 51, respectively. Atoms of different weight but having identical chemical behavior are known as isotopes.

The neutron was identified as an entity only a few months ago. It is a close combination of an electron and a proton. Older theories of atomic structure considered the hearts of atoms as built of protons and free electrons, but the discovery of the neutron has led to the theory that electrons occur within the nucleus only as parts of neutrons. Starting with a helium nucleus and adding alternately a neutron and a proton, Dr. Bartlett obtains all the elements in the chemical table up to oxygen of atomic weight 16, mainly, lithium 6 and 7, beryllium 8 and 9, boron 10 and 11, carbon 12 and 13 and nitrogen 14 and 15. Beyond oxygen, owing to a change in the arrangement of the "bricks" within the inner shell (two neutrons being more stable in the central field than a neutron and a proton) the order of addition becomes: neutron, neutron, proton, proton, and repeat. This gives oxygen 17 and 18, fluorine 19, neon 20, 21 and 22, sodium 23, magnesium 24, 25, 26, etc.

Scientists have not been slow in making use of the neutron in their schemes of atomic structure. Professor Werner Heisenberg, distinguished German physicist, will shortly publish an atomic model with neutrons and protons only as building parts. M. Francis Perrin, of Paris, son of the well-known French physicist, Jean Perrin, has suggested a scheme in which alpha-particles are used in addition to neutrons and protons.

THE ARTIFICIAL DISINTEGRATION OF OXYGEN

OXYGEN has been artificially disintegrated by bombardment with neutrons in experiments at the famous Cavendish Laboratory at the University of Cambridge.

Oxygen is the common gas of the air that all of us breathe and the recently discovered neutrons are fundamental particles of matter, close combinations of proton and electron.

The disintegration is announced in a communication to Nature, by Dr. N. Feather, of Cambridge.

Photographs were obtained of the recoil and paired tracks of the results of the disintegration produced in an oxygen-filled expansion chamber. Polonium and beryllium at the center of the chamber provided the neutrons which hit and smashed the oxygen atoms.

The capture of the incident neutron seems likely in all observations made by Dr. Feather and he concludes that the disintegration particle is almost certainly an alpha particle or the heart of a helium atom.

The results show an absorption of energy and confirm the suggestion made recently by Mme. Curie that a small fraction of the beryllium radiation has a higher energy than the previous upper limit.

Although Lord Rutherford, in 1919 and succeeding years, performed the first artificial disintegrations of a number of elements, notably nitrogen, by bombardment with alpha rays, he did not break down oxygen. His colleague has now done so by using neutrons.

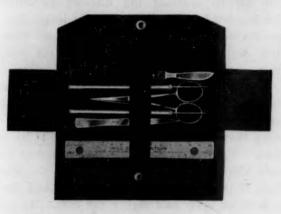
MOLECULE MODELS

STEEL balls of various weights, held together by springs to represent chemical attractions or "bonds," are helping chemists and physicists to understand the work-

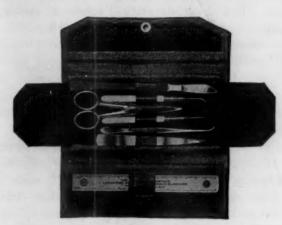
Dissecting Instruments in Sets

UR dissecting instrument sets have been carefully selected and consist of instruments of proven quality and design, compactly arranged in cases, and are admirably adapted to work in anatomy, botany, biology and histology. For student use, we particularly recommend our Nos. 7064 and 7072 in which will be found selections of instruments now being employed by the greater number of educational institutions in elementary work in biology, botany, and general science. All instruments incorporated in the sets are listed singly and may be immediately replaced from stock at any time. Cases are of leatherette, and in all instances are well-made and especially compact.

We can supply, in practically all instances from stock, dissecting sets incorporating any selection of instruments that may be desired, and would indeed be pleased to have the opportunity of submitting quotations on the yearly requirements of university departments whose specifications with regard to instruments are not covered by the sets following.



7064



7072

7064 DISSECTING SET. Consisting of the following instruments in felt-lined, leatherette, one-fold case:

- Scalpel No. 6959, ebony handle, 38-mm edge. Forceps No. 6797, fine, smooth point, 115 mm.
- Needle No. 6842, straight, in cedar handle.
 Needle No. 6847, bent, in cedar handle.
 Scissors No. 7007, medium straight.
 Celluloid rule No. 10497, 6 inches.

Per set

. 1.10

In	quantities	of	. 12	to	49,	per	set	****************	\$.99
In	quantities	of	50	to	99,	per	set	*****************	.90
	quantities								80

7072 DISSECTING SET. Consisting of the following instruments in felt-lined, leatherette, one-fold case:

- 1 Scalpel No. 6959, ebony handle, 38-mm edge.

- Forceps No. 6795, blunt.
 Forceps No. 6792, fine curved.
 Scissors No. 7007, medium straight.
- 2 Needle holders No. 6852, with No. 6857 needles A and C. 1 Celluloid rule No. 10497, 6 inches.

ROCHESTER

Per set

1.30

In	quantities	of	12	to	49,	per	set	BESSESSESSESSESSESSESSESSESSESSESSESSESS	\$1.17
	quantities						set	*************	1.10
In	quantities	of	100,	pe	er 86	et	********		1.00

DRPORATION

LABORATORY APPARATUS AND CHEMICALS FOR CHEMICAL, BIOLOGICAL, METALLURGICAL, AND CLINICAL L'ABORATORIES ings of molecules where the problems have become too complex for even modern mathematics.

At the meeting of the American Chemical Society at Denver, Professor Donald H. Andrews, of the Johns Hopkins University, showed how laboratory models are helping to give a better working idea of what goes on in the submicroscopic world of chemical units.

The steel balls represent the nuclei of atoms. The surrounding planetary systems of electrons are ignored for the purposes of the experiment. It is all right to ignore the electrons, for most of the mass of every atom is concentrated at its nucleus.

Shaken at various speeds by a vibrating machine, these giant "molecules" move practically as rigid units, indicating a state of no chemical or physical activity within the molecule. But at certain critical speeds of shaking, the attached balls dance violently on their springs. And when these speeds are reduced to their equivalents in "exciting" wave-lengths of light, they are found to correspond closely to the stimuli necessary to cause the atoms of molecules to produce the light rays photographed in the so-called Raman spectra, by which molecules "sign their names."

The first model made was the very simple one of water: one atom of oxygen, two of hydrogen. Other relatively simple molecules have also been "made," such as methane (one carbon, four hydrogen), carbon tetrachloride (one carbon, four chlorine), benzene and toluene, which are slightly more complex. Really complicated molecules have not yet been modeled, but the work is going forward.

SPOTTED FEVER

ALL farmers in the area around the national Capital will be vaccinated against Rocky Mountain spotted fever next spring, if the U.S. Public Health Service is able to carry out its present plans. Every year some two hundred cases of this disease occur in the District of Columbia and adjacent states.

Officers of the U. S. Public Health Service, who have successfully fought the disease in Bitter Root Valley, Montana, where it first appeared, have recently found that a certain variety of tick, which abounds in this neighborhood, also carries the germ of the disease. Farmers, holiday-seekers and others who get into the bushes and high grass of the surrounding countryside are liable to contract the disease through being bitten by infected ticks.

The infected area contains a population of about four million. It is impossible to vaccinate the entire population of this area, as has been done in the Bitter Root Valley which has a population of only a few thousand. Furthermore, most people in the Washington area never get into the country where they would be exposed to the disease. The U. S. Public Health Service has warned them that if they do go into the country, they should keep away from bushes, trees and weeds, and watch for the ticks, picking them off as soon as possible. But for the farmers of the area who must be constantly exposed to the danger, the federal health officers hope to be able to offer immunity to the disease through vaccination.

At present the supply of vaccine against Rocky Mountain spotted fever is small. It is both expensive and dangerous to make. No commercial firm will handle it. Several of the federal health workers lost their lives in the production of the vaccine at the Montana laboratory. The vaccine gives immunity to the disease for about one year, and would be given in the spring in the Washington area, as that is the beginning of the season when the infected ticks appear. The end of this season's outbreak in the East is expected within the next two weeks, as at that time the cooler weather will have killed off most of the ticks.

Meanwhile, persons in the country are warned to pull off the ticks as soon as possible after they attach themselves. It is possible to be bitten by an infected tick and not to contract the disease, particularly if the tick has not been on the body very long. But if the tick has stayed on until it becomes engorged with blood and then dropped off by itself, the person stands a good chance of contracting the disease.

Rocky Mountain spotted fever has been prevalent in the Washington area since 1909, although it was not recognized as such until recently. But clinical records show that cases of the disease occurred as long ago as then. From sixty to ninety out of every hundred persons who get the disease die of it in the West. In the East it seems to be slightly milder, and the death-rate is between sixty and eighty per cent. An attack of the disease gives some immunity to subsequent infections, but it is not known how long this immunity lasts. The vaccine which protects against it was developed by Dr. R. R. Spencer, of the U. S. Public Health Service.

THE HYDROELECTRIC POWER PROJECT IN SOVIET RUSSIA

DNEPROSTROY, the hydroelectric power project of Soviet Russia, which was dedicated on August 25, can be described only with superlatives, so far does it exceed similar undertakings in size and difficulty of accomplishment. It is being completed on the Dnieper River in the heart of a region which electricity from this and smaller plants is expected to change into an industrial Utopia.

From an installed capacity of 756,000 horsepower, abundant electricity will be available to smelt iron and other metals and to operate chemical industries. Water is to be pumped to irrigate hundreds of thousands of hectares of rich, but drought-affected, steppe. Steamers from the Black Sea, 200 miles down the Dnieper, will be able to penetrate hundreds of miles farther inland because the dam, and locks built with it, overcome obstructing rapids.

The cost of the dam, power plant, locks and necessary bridges is approximately 220,000,000 rubles or \$110,000,000. Three and one half million dollars was spent for construction equipment alone. It is estimated that an additional 620,000,000 rubles will be consumed in developing the industries that will depend on the new source of power. The dam is the largest masonry structure ever built to impound water and was finished six months ahead of schedule.

nd

atks,

ull mek

ek

nd

bo

FREAS

CONSTANT TEMPERATURE DEVICES

for Research and Control



Ovens: high efficiency types with differential thermostatic temperature controls and horizontal-flow mechanical-convection heating system, insuring uniform, accurate, and rapid heating. Complete range of sizes, for temperatures up to 260°C.



Humidity Cabinets: with combined vapor pressure, humidity, and temperature controls, providing precision equipment for observation of effects under known atmospheric conditions. Both low and high pressure types available.



Oil Baths: for high range work up to 550°F, and for testing, curing and heat treating operations where the absence of air and its oxidizing effect is desired.



Water Baths and Tanks: for general testing or operations requiring accurate control at relatively low temperatures, up to 100°C. Standard laboratory types and special models.



Thermostats: super-sensitive large-size water baths for work involving the highest degree of precision. Temperature range from below room to 50°C and above. Accuracy within 0.002°C.



Dryers: entirely automatic in matter of temperature control, at any degree of heat up to 700°F, constant within 2°F—with mechanical convection heating system—for uniform and rapid production requirements. All sizes desired.

Write for literature or information concerning any or all of the above mentioned, or similar apparatus, in which you are interested.

FREAS THERMO-ELECTRIC COMPANY

Designing Engineers & Manufacturers

Main Office

1207 So. Grove St.

IRVINGTON, N.J.

Branch Office 407 So. Dearborn St.

CHICAGO, ILL.

DISTRIBUTORS OF FREAS LABORATORY OVENS, INCUBATORS, AND WATER BATHS Eimer & Amend, New York, N. Y. Fisher Scientific Company, Ltd., Montreal, Canada. E. H. Sargent & Co., Chicago, Ill. Will Corporation, Rochester, N. Y. Braun-Knecht-Heimann Co., San Francisco, Calif. H. V. Grosch Co., San Juan, Porto Rico. Fisher Scientific Company, Pittsburgh, Pa. Denver Fire Clay Co., Denver, Colo. Kansas City Lab. Sup. Co., Kansas City, Mo. McKesson-Doster-Northington, Inc., Birmingham, Ala. Braun Corp., Los Angeles, Calif. Antiga & Company, Havana, Cuba. Canadian Laboratories Supplies, Ltd., Toronto and Montreal, Canada. Tanaka Shoji Kaishia, Ltd., Tokio, Japan.

This tremendous project was a victory for American methods, because both American and European engineers submitted plans and actually tested them before the final contracts were let. The Europeans intended to use the most hightly developed automatic construction machinery while the American estimate contemplated employing ordinary steam shovels, concrete mixers and railways built to Soviet standards. Foundation work on the dam was begun on one side of the river by the Europeans working as they preferred and on the other side by the Americans employing their methods. It took only a few months for the Soviet officials to decide in favor of the Americans, Colonel Hugh L. Cooper and his organization, and to give them the remainder of the work. The rural Soviet laborers worked more successfully with the simpler American machinery.

Yet, there was a labor problem in the Soviet Union just as there might have been in America. Contrary to wide-spread belief, the government did not make the workers stick to the job. They constantly migrated between farm and industry and often several hundred would leave at one time to go where they had heard they could make more money. Thus the turnover was unusually high, being about sixty per cent. annually. In order to reduce this figure the workers were given houses and comforts superior to those found in most American construction camps. At times as many as 50,000 were employed on the project.

Women worked, too, and were exceptionally efficient. They used surveying instruments and were machine operators, locomotive firemen and concrete placers as well as common laborers. They would often work half an hour after the whistle to perfect a task.

The dam is 3,350 feet long, including the frontage of the power plant, and 140 feet high to the crest of the spillway, above which water will rise as much as 30 feet during floods. This structure impounds a flow varying from 6,300 cubic feet per second during severe droughts to 835,000 cubic feet at times of large freshets. The latter figure represents the greatest flow ever encountered by a structure of this type, and the dam stood this test in 1931 before it was finally completed.

Six of the plant's nine power units, the largest ever built, are now being installed. The turbines, rated at 84,000 horsepower normal capacity and 100,000 horsepower under a maximum head of water, were made in this country. Five of the generators were built in the United States and the remainder are being constructed in the Soviet Union.

While Dneprostroy's normal generating capacity is 756,000 horsepower, it has a maximum or high water capacity of 900,000 horsepower. On account of irregular water flow it will be possible to operate only three of the nine turbo-generating units during the entire year. The world's next largest hydroelectric power plants are Muscle Shoals with a capacity of 610,000 horsepower, 260,000 horsepower of which has already been installed, and Niagara Falls with 430,000 horsepower.

ITEMS

THOUSANDS of lives may have been lost in an earthquake which occurred at about noon on August 14,

Chinese time, in the interior of China, although news of the disaster may be delayed weeks and months in being reported to the outside world. An earthquake shock of at least moderate severity was registered on seismographs throughout the world at 11:39 P. M., Eastern Standard Time, on August 13. Through data wired to Science Service and interpreted by the U. S. Coast and Geodetic Survey, it was found that the center of the disturbance was located in the Yunnan province of the Chinese interior at approximately 27 degrees north latitude and 103 degrees east longitude. This is an earthquake region and there are many inhabitants. It is a part of China known for its sliding mountains and it is probable than many lives were lost. It is south of the Kansu region of China in which destructive earthquakes occurred in 1920 and 1927. The 1920 quake caused 500,000 deaths. The 1927 quake was flashed to the world as a probable major disaster by Science Service's earthquake-reporting service two months before the news from the locality reached telegraph lines.

More than 28,000 meteoric flashes in the night sky were seen from more than 150 localities by several hundred observers who watched for the Perseid meteors early this month (August 10 to 12), it is indicated by reports received by Professor C. P. Olivier, of the Flower Observatory of the University of Pennsylvania, up to August 17. Professor Olivier is president of the American Meteor Society. More persons saw more meteors this year than any previous return of the shower of the famous Perseid "shooting stars," said Professor Olivier, praising the newspaper cooperation that inspired many laymen to make meteor counts and report them. Professor Olivier expects that later reports from the western coast and foreign countries will increase the record.

Perseid meteors falling at the rate of 208 an hour was the record observation of a group of Columbia College students, at Dubuque, Iowa, who watched the recent meteor shower. Even on August 7, which was six days before the peak of the shower, a group of six saw 140 meteors an hour, while an individual observer recorded 80 an hour. The highest rate of 208 an hour was a group observation at 1 A. M. on August 12, when the rate seen by one person was 116 per hour. The observations were organized by Professor John Theobald.

tie

co

for

ca

by

sp

an

ei

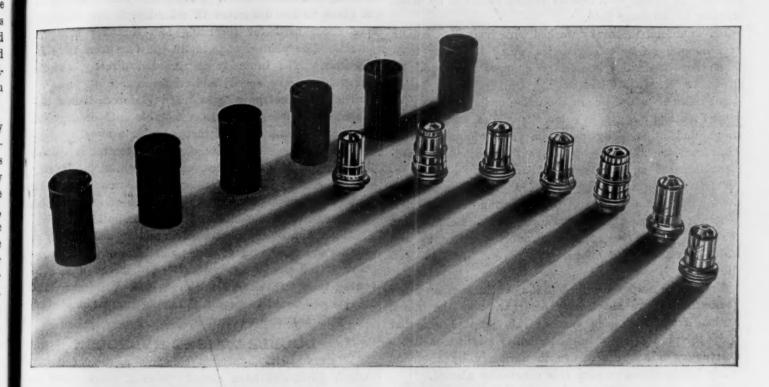
lig

64

THE dough of wheat flour that puffs and blows up energetically as it rises saves the digestive organs work. For the more a dough gases the more readily it converts its starch into sugar easily assimilated by the human body. Digestive organs convert all starch into sugar before it can be used as a building material. The relation between a flour's "gassing power" and its "diastatic activity," or ability to change starch into sugar, was discussed by M. J. Blish and R. M. Sandstedt, of the University of Nebraska, before the Detroit meeting of the American Association of Cereal Chemists. The terms "gassing power" and "diastatic activity" are frequently used interchangeably, although they are not strictly synonymous. Differences among flours in gassing power reflect variations not only in diastatic activity, but also in original sugar content.

For Fine Results Use B&L

Apochromatic Objectives



IN B& L Apochromatic Objectives, the chromatic correction is accomplished for three colors and the spherical correction for two colors. As a result practically all of the images produced by the different colors of the spectrum lie in the same plane and are equally sharp.

Apochromatic Objectives are excellent for *photographic use* with either white or monochromatic light for the violet light is brought

to the same focus as the visual rays.

Every step in the production of these outstanding objectives is B&L controlled. The glass is made in our own plant for only B&L glass meets B&L standards. Consequently we give our fullest guarantee to B&L Apochromatic Objectives.

Range of magnifications from 10X to 90X. Priced from \$26.00 to \$108.00. Write for full details.

BAUSCH & LOMB OPTICAL CO.

642 St. Paul Street

Rochester, N. Y.

0

G

G

1

tl

el

li

F

W

g

w ba

M

li

D

I

ti

b

C(

C

rab

tı

0

q

p

SCIENCE NEWS

Science Service, Washington, D. C.

X-RAYS AND EVOLUTION

X-RAYS can speed up the processes of evolution and they can also reverse its direction, undoing changes which they themselves have caused. This was announced at the meeting of the Sixth International Congress of Genetics at Ithaca by Dr. N. W. Timofeeff-Ressovsky.

The discovery of the evolution-reversing power of x-rays was made as the result of researches conducted at the Kaiser-Wilhelm Institute for Brain Research in Berlin. It agrees with similar results obtained by other workers in the same field.

Dr. Timofeeff-Ressovsky worked with fruit flies, classic experimental animals in genetics, using the x-ray technique for producing hereditary changes developed by Professor H. J. Muller, of the University of Texas. Bombardment of their reproductive cells with x-rays caused marked changes in color, shape, size, etc., of eyes, wings and other body parts in their offspring. Dr. Timofeeff-Ressovsky discovered that a second bombardment inflicted on these same offspring would often reverse the changes, causing the third generation to have a normal appearance again. He also found that the first generation x-raying often produced opposite changes at the same time; for example, producing red eyes and white eyes among the offspring of normal brownish-eyed flies.

From his results he argued that the effects of an x-ray bombardment are not merely destructive of the genes, as has frequently been stated. He pointed out that while the production of an abnormality might look like a destructive effect, the return to normalcy by a second x-ray bombardment makes this conclusion absurd.

Other strange effects of x-ray bombardment were demonstrated by Dr. Lewis Knudson, of Cornell University, with a series of cultures of ferns in their earliest stages of growth. The spores from which they sprouted were treated with x-rays at varying intensities and lengths of exposure. Doses of 2,500 and 5,000 roentgens increased the rate and quantity of growth. But doses from 7,000 to 30,000 roentgens stopped growth altogether. These heavier x-rayings, however, did not kill the sporeling ferns, for examination with the microscope has shown that they produced one or two massive cells that continue to live but do not grow, although they have been kept for over six months.—Frank Thone.

MEASURING ULTRA-VIOLET RAYS

A NEW machine for measuring ultra-violet light accurately has been developed by Ernest Victoreen, working under the direction of Dr. Hugo Fricke who is head of the department of biophysics of the Biological Laboratory at Cold Spring Harbor. The machine makes use of the principle of the photoelectric cell, Mr. Victoreen explained in describing it to his associates at the laboratory. It is expected to be useful in measuring ultraviolet light from artificial sources when used in the treatment of rickets and tuberculosis, and also for de-

termining exactly the amount of ultra-violet light from sunlight available in various localities for treatment and for building up general bodily resistance.

Methods of measuring ultra-violet light in general use depend on chemical or biological effects, such as the oxidation of oxalic acid, blackening of sulfides, bleaching of dyes, effect on photographic paper, reddening effect on the skin and bacteriological effects. Most of these methods in actual use are of poor accuracy, time-consuming and inconvenient. Furthermore, no consideration is given to the difference in wave-length dependence of the effect used for recording and that for biological effect. The photoelectric method is free from these objections. The intensity is recorded directly, and the method is simple, speedy and convenient.

The photoelectric cell which Mr. Victoreen showed consisted of a glass bulb with a metallic cathode deposited on the inside surface and in the center a metal ring acting as anode. A definite electric potential is induced between the two electrodes, which potential is gradually neutralized by the electron emission from the cathode due to the ultra-violet light. The rate of neutralization is a measure of the intensity of the radiation.

The action of the photoelectric cell depends largely on the nature of the metal used as cathode and the absorption of the envelope. With different metals and different glasses of suitable thickness, Mr. Victoreen stated that a cell could be produced having its maximum sensitivity at any desired wave-length.

DOUBLE WEIGHT HYDROGEN

Working with hydrogen chloride, a substance from which physicists have already learned much about the constitution of matter, Professors E. F. Barker, D. M. Dennison and J. D. Hardy, of the University of Michigan, have confirmed the existence of hydrogen atoms practically twice as heavy as those of the ordinary variety, but otherwise identical with them.

The discovery of the hydrogen isotope of mass two was first reported last December by Professor Harold C. Urey and Dr. G. M. Murphy, of Columbia University, and Dr. F. G. Brickwedde, of the U. S. Bureau of Standards. They worked with liquid hydrogen in the laboratory of the Bureau of Standards where, not long before, helium had been liquefied for the first time in the United States.

The Michigan investigators reported that in hydrogen chloride the heavy atom occurs very rarely—only one to about 35,000 of the common weight. The double-weight atoms have been found to be comparatively plentiful, however, in water left over from the electrolysis process by which oxygen and hydrogen gases are produced commercially.

A paraffin-lined metal tube, eight inches in diameter and twenty-two feet long, 95 per cent. filled with the hydrogen chloride gas, was used at the University of Michigan laboratories. Light for the analysis was obtained through mica windows in the tube.

OBSERVATIONS ON MT. WASHINGTON

THE summit of Mount Washington, the highest of the White Mountains, will be occupied by a scientific party this fall for the first time since 1887. Weather, aurora, magnetic, radio and other observations will be made at a height of 6,288 feet, as a part of the second polar year program being participated in by many nations this year and next.

The observing program is being arranged under the direction of Joseph B. Dodge, manager of the Appalachian Mountain Club huts in the White Mountains, with the cooperation of leading scientific men, among them Dr. Charles F. Brooks, director of the Blue Hill Observatory of Harvard University, Professor J. W. Goldthwait, of Dartmouth College, and Dr. Norman E. Gilbert, also of Dartmouth, president of the New Hampshire Academy of Science.

Three observers will live on the summit from October 15 to June 15 of next year. Although geographically in the temperate zone, the summit of Mount Washington is climatologically in the Arctic. It is above the timber line and temperatures as low as 59 degrees below zero Fahrenheit and wind velocities up to 186 miles per hour were recorded there during the 17 years, 1871–1887, that government weather bureau observations were made there winter and summer.

At the Pinkham Notch headquarters camp of the Appalachian Mountain Club, weather and other observations will be made regularly during the winter to provide a basis of comparison for the observations made on the Mount Washington summit two and one half miles air line distance, but 4,281 feet higher in altitude. Mr. Dodge has spent eleven years, summer and winter, in the White Mountains, living with his family at Pinkham Notch. He will manage the expedition and serve as relief on the summit for the regular observers, as well as operate the comparison station at Pinkham Notch. In earlier winter observations near-by comparison stations were lacking.

A complete radio station with call letters WIOB will be installed on the summit to allow the observers to communicate with polar year expeditions in the far north and other points in the outside world. Constant communication will be maintained with Mr. Dodge's radio station, WIUN at Pinkham Notch. There will also be regular schedules with Boston and other cities for the transmission of daily weather and magnetic observations. The transmitters will use the amateur frequency bands of 3,500 to 4,000, 7,000 to 7,300 and 14,000 to 14,400 kilocycles. Considerable work is planned in ultra high frequency bands at 56 megacycles or above. A special power plant will feed the tubes with an output of 250 watts.

The observers on the summit will be: Robert Scott Monahan, of Pawtucket, Rhode Island; Salvatore Pagliuca, a native of Milan, now with the General Electric Company, Lynn, Massachusetts, and either Albert Sise, of Brookline, Massachusetts, or Alexander MacKenzie, of Albany, New York. All are experienced mountaineers well equipped for the work.

Although not as high as western mountain peaks, such as Pike's Peak, Mount Washington has temperatures and winds that are not equalled on higher mountains on the continent. The expedition during the coming winter will recall the hardships suffered during the winters of the 70's and the 80's by the observers that occupied the signal station of those days and made the first continuous weather records from any American mountain top.

ITEMS

RECENT exhaustive research on foreign chondrus, or Irish moss, which is used in industry as well as in foods and medicines, will most probably save an American industry from ruin, it appears from a report of Drs. Charles H. LaWall and Joseph W. E. Harrisson, of the Philadelphia College of Pharmacy at the meeting in Toronto of the American and Canadian Pharmaceutical Associations. The gathering of this seaweed is quite an important industry on the New England coast. The American product is sun-bleached, a long and tedious process, which makes it impossible to sell it at the much lower price of the imported product. The foreign product is bleached with sulphur dioxide, Drs. LaWall and Harrisson found. They first became interested in the matter when appreciable amounts of sulphites were found in a commercial product which used imported Irish moss. The manufacturers attempted to prove that sulphur dioxide is a natural constituent of Irish moss, just as benzoic acid is of cranberries. This contention was proved false. Drs. Harrisson and LaWall recommend that manufacturers using the foreign product should be compelled to label their product properly, showing that sulphur dioxide was used in the bleaching. This would relieve the American industry of the handicap under which it has labored with its sun-bleached product.

Pithecanthropus erectus, the ape-man of Java, has had his existence as a true zoological genus confirmed through the recent discovery of three more thigh bones by Dr. Eugene Du Bois, of Holland, well known for his original find of the much-disputed fossils over forty years ago. This is the opinion of Professor G. Elliot Smith, English anthropologist. The three newly discovered thigh bones will be eagerly awaited by scientists, the more so because the original, or "type" specimen, is flawed with a bony outgrowth that probably made its owner lame. Except for this imperfection, the three new bones are declared to be identical with the Pithecanthropus type in every respect; and they were found at Trinil, the site of the original discovery. During recent months, Java has been the scene of several dramatic developments in the story of early man. First came the discovery by W. F. F. Oppenoorth and C. ter Haar, of remains of a race resembling Neanderthal Man, which has been named Homo (Javanthropus) soloensis. Then came Dr. Du Bois's statement, a little over a month ago, that two other skulls found in Java suggest the origin of the black natives of Australia from a race that migrated via the East Indies. Now Pithecanthropus comes back into the news with his three new-found thigh bones.

New Lea & Febiger Text-books

New Work

Just Ready | New Work

A Text-book of Pathology

An Introduction to Medicine

By WILLIAM BOYD, M.D., M.R.C.P. Ed., F.R.C.P. Lond.,

Dipl. Psych., F.R.S.C.
Professor of Pathology in the University of Manitoba;
Pathologist to the Winnipeg General Hospital, Winnipeg, Canada

Octavo, 946 pages, with 286 engravings and a colored plate. Cloth, \$10.00, net

This work is intended for the student of pathology, whether undergraduate or postgraduate. It elucidates the vital processes which underlie the end results studied by the morbid anatomist. It presents disease from the physiological point of view and shows pathology in relation to the living. It offers an introduction to medicine and surgery to the student and an excellent review of morbid anatomy to the clinician.

Human Odontography and Histology

A Text-book for Undergraduates and Graduates in Dentistry and Dental Hygiene

By HERMAN R. CHURCHILL, Tandarts (Utrecht), D.D.S.

Dr. Med. Dent. (Rostock)

Assistant Professor of Dental Histology, Histopathology
and Comparative Odontology, University of
Pennsylvania, Philadelphia, Pa.

Octavo, 298 pages, with 347 engravings and a colored plate. Cloth, \$4.50, net

This work offers a brief outline course for dental students and at the same time furnishes students of oral hygiene with a review of Odontography and Histology as far as they should know and understand it. Deciduous teeth are emphasized in the discussion of odontography. The section on histology covers the fundamentals of embryology, dental structures, mucous membranes and salivary glands.

EA&FEBIGER

Please send me books checked:

Boyd's Text-Book of Pathology

☐ New Catalogue 4.50

Churchill's Human Odontography Name

(S. 9-2-32)

Address .

RESEARCH CHEMIST, PHYSICIST, Ph.D., Illinois, 1931, married, age 29, desires teaching, research position. Experience in spectroscopic, x-ray fine structure analysis, gasoline engine combustion analysis. One year industrial x-ray experience. Publications. Available immediately. Best references including last employer. Address Box 355, Harvard, Nebraska.

NEW (15th) EDITION OF

THE MICROSCOPE By SIMON HENRY GAGE

Revised throughout, and a wholly new chapter on the Ultra-Violet Microscope. Price, \$4.00.

THE COMSTOCK PUBLISHING CO, Ithaca, N. Y.

AMERICAN TYPE CULTURE COLLECTION

About 2500 pure cultures of bacteria, yeasts and fungi from reliable sources.

Special efforts made to secure cultures not in the collection. Catalogue and quotations on request. Curator, American Type Culture Collection, John McCormick Institute for Infectious Diseases, 637 South Wood Street, Chicago, Illinois.



Field Equipment for Engineers, Explorers, Hunters, Travelers

Scientific Instruments, Packing Equipment, Skis, Firearms, Clothing, Fiala Pat. Sleeping Bags, Optical Instruments, Astronomic Telescopes, Range Finders, Binoculars. Paulin Altimeters. Write for Catalog "A" FIALA OUTFITS

47 Warren St., New York

THE WISTAR INSTITUTE BIBLIOGRAPHIC SERVICE

Washington Square PHILADELPHIA

AUTHORS' ABSTRACTS

of all papers appearing in the journals listed below prior to publication of the articles in full. By this advance information biologists may familiarize themselves with contemporary research in a minimum of

Advance Abstract Sheets are issued twice a month, each sheet containing ten or more authors' abstracts.

Subscription rate is \$3.00 per year.

Bibliographic Service Cards, following the Advance
Abstract Sheets, also are issued twice a month. In addition to the authors' abstracts, the cards provide subject headings and complete bibliographic reference. The cards are convenient for filing and library records. Price, \$5.00 per year.

At regular intervals the authors' abstracts are assem-bled and published in book form with complete authors' and analytical subject indices. Price, \$5.00 per volume. Liberal discount to subscribers to the Bibliographic Service Cards.

JOURNAL OF MORPHOLOGY
THE JOURNAL OF COMPARATIVE NEUROLOGY
THE AMERICAN JOURNAL OF ANATOMY
THE ANATOMICAL RECORD
THE JOURNAL OF EXPERIMENTAL ZOÖLOGY
AMERICAN ANATOMICAL MEMOIRS
AMERICAN JOURNAL OF PHYSICAL ANTHROPOLOGY
JOURNAL OF CELLULAR AND COMPARATIVE PHYSIOLOGY
FOLIA ANATOMICA JAPONICA (Tokyo, Japan)
PHYSIOLOGICAL ZOÖLOGY (Chicago, Illinois)
STAIN TECHNOLOGY (Geneva, New York)
ECOLOGICAL MONOGRAPHS (Durham, North Carolina)

The Wistar Institute of Anatomy and Biology Philadelphia, Pa., U. S. A.



JAMES G. BIDDLE CO.

ELECTRICAL AND SCIENTIFIC INSTRUMENTS

1211-13 ARCH STREET, PHILADELPHIA, PA.

THE First Autoclave with the Eclipse Door. Originated in 1900 and developed to keep pace with the advances of laboratory technique.

Authorized dealers everywhere



BRAMHALL, DEANE CO.

Established 1859

51 East 21st Street NEW YORK

years of Manufacturing Experience



HE building of equipment for synthetic hydrogenation of organic substances under high pressure and at high temperature has been a matter of production routine at the American Instrument Company plant for the past eight years.

One item of AMINCO Superpressure equipment extensively used in university and industrial laboratories is the electrically heated Shaking Autoclave shown above, with a reaction chamber of 16 cubic inches and a maximum heating capacity of 2,000 watts. It is designed for pressures up to 1,000 atmospheres and temperatures up to 752 F. The same equipment is made in one gallon capacity and for higher pressures and temperatures, is built to customer's specifications.

Complete hydrogenation equipment and apparatus for high-pressure work in general is available out of stock or for quick delivery. Special orders are exskilled designers and craftsmen who are thoroughly experienced in this exacting type of work.

Write for Special Bulletin No. 405, "An Introduction to Superpressure Equipment"

AMERICAN INSTRUMENT CO., Inc.

Girard Street, Northwest Washington, D. C., U. S. A.

SCIENCE NEWS

Science Service, Washington, D. C.

THE ECLIPSE AND THE WEATHER

Eclipse observation results seem to summarize themselves broadly as: success toward the southeast, near the coast; failure at the farthest inland stations, at least partial success in between. It was the weather's doings. A great cloud mass stretched itself across Quebec and part of New England, blotting out the sun toward the west, reaching fingers of haze and broken cloud to annoy astronomers and other observers in the middle stations that clustered around Fryeburg, Maine, and Conway, N. H., but not reaching the area near Portland soon enough to get ahead of the racing shadow of the moon.

It was in the Fryeburg-Conway region that the doubtful weather conditions tried scientists the most sorely. Here the largest army of astronomers had assembled, bringing the heaviest celestial artillery. While parties farther east blessed their luck that gave them perfect observing and photographing conditions, and their disappointed colleagues some hundreds of miles westward could sit as philosophically as possible under a blanket of completely interdicting cloud, the Fryeburg-Conway parties had regular political weather—yes-and-no weather. So they could only go through their carefully-rehearsed program of photographing the sun and its spectrum, and hope that at least a part of the plates would be of real value to science.

Only the airplane parties, which could spurn the clouds and rise as high as gasoline-impelled wings could lift them, did not need to worry about the clouds. These reported complete success in their programs, astronomical, physical and meteorological. The only difficulty is that the most important work at an eclipse is that done with the telescopic "big Berthas" and as yet there is no way known to fly one of these ten thousand feet off the ground and above the clouds.

All round, therefore, the total eclipse of 1932 will have to be voted, if not a failure, still not a hundred per cent. success; but something between the two. Wherein it differs not at all from most of our more commonplace undertakings.

THE CELLULOSE MOLECULE

How big is a molecule of cellulose, and how is it put together? This question, which is of practical as well as of scientific importance, because cellulose is the principal constituent of all wood, as well as of cetton, flax, rayon and other textile materials, occupied much of the attention of chemists attending the York meeting of the British Association for the Advancement of Science. The more chemists know about the size and make-up of the cellulose molecule the more they can do with it.

Professor W. N. Haworth, of the University of Birmingham, said that the cellulose molecule is a chain composed of glucose units arranged as rings. The ends of the chain are chemically "loose," not looped back on themselves. The molecular weight of cellulose, he stated,

is about 30,000; this indicates that the molecule is, comparatively speaking, enormous; the molecule of glucose for example has a molecular weight of only 180.

German chemists have been trying to measure the length of the cellulose molecule, but they are still in rather wide disagreement. Professor H. Staudinger, of the University of Freiburg, stated that one of these chain-molecules is 4,000 Angstrom units long, while Professor Hermann Mark, of the University of Karlsruhe, found a length of only 600.

An Angstrom unit is the inch of the light-measuring physicist. It is one ten millionth of a millimeter, and a millimeter is about the width of an ordinary lead pencil mark.

Professor L. Zechmeister, of Pecs University, Hungary, with Dr. W. Grassman, of the University of Munich, are using an interesting method in their efforts to measure the elusively tiny cellulose molecule. They approach the problem indirectly, through observations of the effects on cellulose products of enzymes extracted from Aspergillus, the blue-mold fungus.

COLONY MANAGED BY SCIENTISTS

THAT the British Government should found an experimental colony to be run by engineers, scientists and economists was the unusual proposal made at the meeting of the British Association for the Advancement of Science by Professor Miles Walker, of the University of Manchester, in his address as president of the section of engineering.

"The object in view would be to ascertain how far it is possible with our present knowledge and the best methods of manufacture and distribution for a group of say 100,000 persons to maintain themselves and continually to increase their wealth when freed from the restraints and social errors of modern civilization." According to Professor Walker, a community in which engineers and scientists were the leaders in place of our present-day rulers would be free of many of the defects of our civilization.

"All through our 'civilization' vested interests block the way to improvement. Long after science has shown the way to make things better for the people, unintelligent control and stupid prejudice preserve the old evils and refuse to be convinced.

"There are many things to be ashamed of in our great cities. Not the least of these is the waste that goes on. There is waste of heat in domestic fires; waste of byproducts in the consumption of coal, thereby producing dirt; waste of fresh air by pollution; waste of sunshine, and, above all, the waste of labor that might be applied in stopping all the other desolation and loss; waste of money by paying dole while there are obvious jobs for everybody.

"If engineers were in control, they would so order matters as to neutralize this waste at the source."

f

PREHISTORIC MAN IN BRITAIN

WHEN man first came to Britain, the Thames ran into the Rhine. For in the earliest days of the Old Stone age, in the beginning of the Ice Age, or even before its beginning, sea-level was much lower along the shores of western Europe, and the North Sea was dry land, with the ancestor of the Rhine draining its broad valley and receiving the Thames as a tributary.

This was the beginning of the picture of the pre-history of man in Britain sketched before the geologists of the British Association for the Advancement of Science by their sectional president, Professor P. G. H. Boswell, of the Imperial College of Science and Technology, London.

Prehistoric man in Britain did not leave any frescoed or sculpture-decorated caves, as he did in France and Spain; and his actual skeletal remains are few and far between. But there are considerable numbers of stone tools of all the principal stone age culture levels, and these can be made to tell a fairly well-connected story.

The earliest stones credited with being shaped by man are crude hand-choppers. So rough is the workmanship on these that many students refuse to believe that they are man-worked at all, believing them to be merely the results of accidental breaking. However, if these "pre-Chellian" stones really represent human workmanship, then man was present in Britain even before the Ice Age, and the animals he hunted (or fled from) included the elephant, the hippopotamus and the rhinoceros.

Stone implements of the next succeeding culture type, the "Acheulean," still exceedingly rough and crude, have been found associated with bones of reindeer and mammoth, indicating the onset of colder times; for these two beasts were both Arctic in their natural habitat choices. Following this stage came the "Mousterian" culture, commonly associated with the low-brow Neanderthal race. Mousterian flints have been found with bones and plant remains of temperate-zone type; the British Neanderthaler had things a little easier than his predecessor of Acheulean days.

And so the advance and retreat of man in Britain continued, following the retreats and advances of the glacial ice fields, each successive improvement in his flint workmanship suggesting a further step in his cultural advance.

MINING INDUSTRIES' INCREASING NEED FOR SCIENCE

Professor A. O. Rankine, of the Imperial College of Science and Technology, London, in his address before a session of the British Association for the Advancement of Science pointed out that economy during this era of depression should not lead to neglect of the development of the sciences such as geophysics.

Professor Rankine deplored the fact that in scientific undertakings we have not developed as yet one of the principles that is fundamental to the family. When there is a call, as now, for economy, it is not the full-grown and robust branch but the new born and underdeveloped which first feels the pinch.

Progress in the application of physical methods to prospecting has come within the past forty years, he showed. Eötvös, physicist of the latter part of the nineteenth century, Professor Rankine called "the reluctant pioneer." This physicist had invented a torsion balance, and the geologist de Böckh with difficulty persuaded him to use this instrument to locate and delineate salt domes. Eötvös regarded it as debasing his science to use his instrument for a purely economic purpose. Such use, however, was responsible for further refinements in the instrument, an advance in pure physics cited by Professor Rankine to emphasize the point that physics and geology, working hand in hand, get nearer the truth than either one alone.

The torsion balance of gravitational method has been the most successful method of applying physics to prospecting, by the measurement of gravitational disturbances. The seismic method has been most successful in determining the depth of water by means of the echosounding machine, but it is far less accurate in application to the solid earth because the attenuation of vibrations with distance is far greater and there are many other disturbing factors. The magnetic method Professor Rankine considers the best as well as the cheapest, where it is applicable, but he has long felt the need of a new instrument to correct for the daily variation of the earth's field, for temperature changes and for internal friction. He has been at work on such an instrument on the same lines as the torsion balance of Eötvös, but has not eliminated the mechanical difficulties of construction. The electrical method, which was used as early as 1830, has up to now been a jealously guarded trade secret and is therefore the least known geophysical method.

SCIENCE IN ENGLISH SCHOOLS

Better science courses for elementary and secondary schools of England, which will train the children for life rather than for examinations, were urged by W. Mayhowe Heller before the British Association for the Advancement of Science.

The speaker pointed out that the teaching of science in English schools has increased greatly during the present generation. "As a measure we might take the number of school balances in use. Forty years ago the number could not have exceeded a few hundreds; to-day it must run well into six figures."

The quality and purpose of the instruction has, however, retrograded rather than advanced and the blame for this is placed upon a lack of common sense in teaching and upon artificial constraints, such as those placed on the schools by the examination system.

"The curricula of many schools—especially secondary schools—are based upon the demands of external examinations, and take little thought of the human material handled or the shape into which it should be molded to fit accurately into its place in the machine of life. It results in mass-production from the same mold without reference to the markets it is intended to supply.

"School science for the average boy and girl should, in the first place, provide broad and real knowledge that

will, as far as possible, render intelligible the phenomena of common experience; and, secondly, provide a training in the formation of sound judgments and alertness. Its teaching can not be adapted to traditional linguistic methods."

Mr. Heller advocated the formation of a national clearing-house for educational research such as the proposed Imperial Institute of Education.

THE WORKER'S HEALTH AND HIS JOB

Dr. Angus Macrae told members of the British Medical Association at their centenary meeting in London that the industrial worker's health depends not only on sanitary, healthful work environment, but on the mutual suitability of the worker and the job.

The industrial physician of the future must not be content merely to reject candidates because of physical defects. He must be ready to help those with defects to find suitable employment, and he must certainly make some effort to guide the fit and the superfit, whom he accepts, to suitable tasks in his own plant. Dr. Macrae, in commenting on recent efforts to protect the health of workers in certain trades, suggested that every trade may be dangerous, or at least unhealthy for certain types. "Improvements in methods and conditions of work will not suffice to make a man a good worker or a healthy worker if, physiologically, he is a square peg in a round hole."

Physician, psychologist, teacher, parent and employer are all concerned and must all work together at the task of fitting the individual to the proper job. Physical strength and mental ability must be known, and equally important are such intangible attributes as natural aptitude, character and temperament. Dr. Macrae spoke a good word for the often maligned intelligence tests, and described some of the new psychological tests designed to show special abilities and temperaments.

While the work of vocational guidance naturally should begin at the end of school, it should not stop there. Many older workers need such guidance, particularly if accident or ill health has befallen them after years of employment. Nor should vocational guidance be limited to the children of the laboring classes.

ITEMS

Noise, and the problems associated with it, will be investigated in the new acoustic laboratories described at a meeting of the British Association by Dr. G. W. C. Kaye, superintendent of the department of physics at the National Physical Laboratory at Teddington. He stated that in the laboratories each of the experimental rooms is as completely isolated as possible, the massive double walls are on independent foundations, and the rooms are asymmetric both in plan and elevation. Dr. Kaye pointed out that noise is generally regarded as an attendant evil of present-day civilization, though the problem is really one of long standing. There is, however, a steadily increasing volume of public opinion which is making its influence felt beneficially in many directions.

STONES, no less than men, animals and plants, are attacked by germs. And these bacterial onsets can cause serious damage to building materials. So stated Professor S. G. Paine, of the Imperial College of Science and Technology, London, before a meeting of the British Association. Reviewing the work of other botanists as well as his own researches, Professor Paine pointed out that primarily this bacterial disintegration of stone is beneficial, for it is one of the things that breaks down solid rock into soil fit for farms and forests. But on the works of man the bacteria, some of them the identical ones that are helpful in the soil, often work havoc. A new type of bacterium has been discovered during the researches under the direction of Professor Paine. This species is able to live on certain sulfur compounds that naturally occur in some kinds of stone, leaving sulfur deposits on the surface.

Efficient digestion has been an aid to evolution. This, in brief, was the thesis of a paper presented before the zoologists of the British Association, by Dr. C. M. Yonge, of the Marine Laboratory at Plymouth, England. The lowest forms of animal life, the protozoa, all surround their food and digest it inside the cell. This makes for a good deal of labor, first in getting the food particle inside, then in getting the indigestible parts out again, besides cluttering up the cell during the process. The higher animals digest their food outside the cells. Nothing enters the cells until it has been reduced to a solution or otherwise liquefied. This makes for greater speed and efficiency in the feeding process, and leaves the animal free to pursue non-feeding activities a larger part of the time.

EXPERIMENTS showing that iodine-containing compounds probably control sleep in man and hibernation in other animals were reported by Dr. G. S. Carter to the British Association for the Advancement of Science meeting in York, England. Dr. Carter experimented with hearts taken from frogs in winter and in summer. He found that thyroxin, which is the iodine-containing secretion of the thyroid gland, produced in the heart of the winter frog a curve of temperature and pulse rate typical of the heart of the summer frog. Other glandular substances did not have this effect. He concluded that the amount of thyroxin in the circulating blood controlled the hibernation of frogs and similar animals. Other experiments suggested that a similar rhythm in the amount or activity of iodine compounds in the circulation plays a part in the production of man's daily sleep.

DR. CLAIR E. TURNER, of the Health Education Research Laboratory of the Massachusetts Institute of Technology, and associates, found in a study of 1,000 school children that fewer than twenty of them gained weight every month of the school year. When children who failed to show any gain in three months were compared with those gaining regularly, three times as many were found to have unhygienic habits, twice as many had serious physical defects, and twice as many had had recent illness.

at-

sh

a8

ut

is

n

10

al

A

THE WISTAR INSTITUTE BIBLIOGRAPHIC SERVICE

AUTHORS' ABSTRACTS

of all papers appearing in the journals listed below prior to publication of the articles in full.
By this advance information biologists may familiarize themselves with contemporary research in a minimum of

Advance Abstract Sheets are issued twice a month, each sheet containing ten or more authors' abstracts. Subscription rate is \$3.00 per year.

Bibliographic Service Cards, following the Advance Abstract Sheets, also are issued twice a month. In addition to the authors' abstracts, the cards provide subject headings and complete bibliographic reference. The cards are convenient for filing and library records. Price, \$5.00 per year.

At regular intervals the authors' abstracts are assembled and published in book form with complete authors' and analytical subject indices. Price, \$5.00 per volume. Liberal discount to subscribers to the Bibliographic Ser-

vice Cards.

JOURNAL OF MORPHOLOGY
THE JOURNAL OF COMPARATIVE NEUROLOGY
THE AMERICAN JOURNAL OF ANATOMY
THE ANATOMICAL RECORD
THE JOURNAL OF EXPERIMENTAL ZOÖLOGY
AMERICAN ANATOMICAL MEMOIRS
AMERICAN JOURNAL OF PHYSICAL ANTHROPOLOGY
JOURNAL OF CELLULAR AND COMPARATIVE PHYSIOLOGY
FOLIA ANATOMICA JAPONICA (Tokyo, Japan)
PHYSIOLOGICAL ZOÖLOGY (Chicago, Illinois)
STAIN TECHNOLOGY (Geneva, New York)
ECOLOGICAL MONOGRAPHS (DURHAM, NORTH CAROLINA)

The Wistar Institute of Anatomy and Biology

Philadelphia, Pa., U. S. A.

NEW (15th) EDITION OF

THE MICROSCOPE By SIMON HENRY GAGE

Revised throughout, and a wholly new chapter on the Ultra-Violet Microscope. Price, \$4.00.

THE COMSTOCK PUBLISHING CO., Ithaca, N. Y.

Second Edition: Revised and Enlarged THE RAT: DATA AND REFERENCE TABLES

Memoir No. 6: 458 pages. Bibliography: 2206 titles

HENRY H. DONALDSON

Published by THE WISTAR INSTITUTE

Philadelphia, Pa., U. S. A.

Price, \$5.00

The Rat: A bibliography, 1924-1929.

L. E. DRAKE and W. T. HERON 1353 titles-with subject index.

Price-50 cents

Orders may be sent to

The Wistar Institute, 36th Street & Woodland Ave., Philadelphia, Penna.

Well established London firm desires to hear of NEW developments in Scientific, Optical and Electrical laboratory and works equipment, with a view to creating a vigorous demand in Great Britain.

Write to W. Edwards & Company, Allendale Road, Denmark Hill, London S. E. 5, England.

Publications of The New York Botanical Garden

Flora of the Prairies and Plains of Central North America

by Per Axel Rydberg, Ph.D.

A cloth-bound volume containing 969 pages, with 601 text-figures. It includes descriptions of 177 families, 1066 genera, and 3,988 species, keys to all groups, with glossary, etc. It aims to describe all the native and naturalized species of ferns, fern-allies, and seed-plants of Kansas, Nebraska, Iowa, Minnesota, South Dakota, and of parts of Illinois, Wisconsin, Missouri, Oklahoma, Colorado, Wyoming, Montana, Manitoba, and Saskatchewan. Published April, 1932. Price \$5.50, postpaid. postpaid.

Serials

Journal of the New York Botanical Garden. Monthly; \$1.00 a year.

Mycologia, bi-monthly, devoted to fungi; \$5.00 a year.

Addisonia, quarterly, including colored plates and popular descriptions of flowering plants; \$10.00 a

th American Flora. Descriptions of the wild plants of North America; 71 parts now issued; \$1.50 per part for subscriptions to complete sets; North American Flora. certain parts separately at \$2.00 each.

Memoirs of The New York Botanical Garden.
nical papers; \$3.00 a volume (vol. VII, \$5.00) Tech-Brittonia. A series of botanical papers; \$5.00 a volume.

Address The New York Botanical Garden Bronx Park (Fordham Station) New York, N. Y.

The

Foundations of Science

By H. POINCARE

Pp. xi + 553.

Containing the authorized English translation by George Bruce Halsted of "Science and Hypothesis," "The Value of Science" and "Science and Method," with a special preface by Poincaré, and an introduction by Josiah Royce. Price, postpaid, \$5.00.

THE SCIENCE PRESS

Grand Central Terminal

New York, N. Y.

SCIENCE NEWS

Science Service, Washington, D. C.

PSYCHOLOGISTS AT ITHACA

A RACE of super-men in intelligence might be attained through selective breeding, provided social factors ever permitted the experiment, it is indicated by experiments reported before the American Psychological Association, meeting at Ithaca on September 8, 9 and 10, by Dr. R. C. Tryon, of the University of California. Such a superintelligent race has actually been produced among rats in the laboratory by Dr. Tryon. He has also produced by selective breeding another race of moron rats. The bright "family" display their superiority throughout most of the life span, and are succeeded by superior progeny. In this first experiment thus demonstrating the hereditary nature of intelligence, the entire environment was kept strictly the same for both races of rats. The inheritance of physical factors such as weight, sex, pigmentation and fertility seemed to have no relation to the inheritance of mental ability.

IF you drink alcohol with the idea of pepping up your physical processes and stimulating your behavior, you are taking the wrong drug for the purpose, according to a report by Dr. A. L. Winsor, of Cornell University. Alcohol, he has found in experiments where he measured the flow of saliva, slows that part of the digestive process and should be classed not as a stimulant but rather as a narcotic. Willing male adults served as subjects in the experiment and submitted to the examination before and after drinking the alcohol. Cocktails, Dr. Winsor found, serve as an appetizer only when taken just before the meal. Later, when the alcohol has reached the blood, they have the opposite effect.

KEEP your lines of type short. Print in a color contrasting in brightness with the background. Use a moderate space between lines. Use 10-point type. Use any one of eight type faces in common use, but no "freaks." These are rules which the advertiser might formulate for securing ease in reading his printed message, as a result of experiments conducted at the University of Minnesota by Dr. Miles A. Tinker and Dr. Donald G. Paterson, and reported by Dr. Tinker. No important differences in speed of reading were found between the more common type faces. Text in American typewriter was read somewhat slower than the others, and cloister black and old English much slower. Lines 31 inches long with 2-point leading between were most legible with 10-point type. Printers would save considerable money if they realized that a one-point space between lines is no better than type set solid.

More than four numbers on a license plate makes it impossible to catch speeding drivers by noting their numbers, Dr. James L. Graham, of Lehigh University, warned psychologists. A specially devised apparatus with a reducing lens which changed the apparent distance, made it possible to test in the laboratory ability to read plates rapidly fading into distance. With three-number plates in black letters on a white ground, 94 per cent. were seen

correctly, but only nine per cent. of seven-number plates were legible. Only 64 per cent. of five-number plates could be read, although speed used in the laboratory was only a third to a fifth of usual road speed. Bright reflecting surfaces greatly reduce legibility, he said, and color is also important. When lighted only by tail light, blue on orange background is about 30 per cent. better than the same colors reversed.

A MINIATURE car with standard automobile controls traveling on a miniature highway was used by Dr. Alvhh R. Lauer, of Iowa State College, in testing drivers to find the psychological factors underlying good and bad automobile driving. Response to traffic signals and ability to park in a minimum space were also measured on a "life size" field. Men differ from women, it was found; parking time for women being more than twice that required by men.

An ape brought up with a child in a human family is superior to her human "brother" in performance on a number of mental tests and experiments, according to Dr. W. N. Kellogg. Motion pictures were shown by Dr. Kellogg, professor at Indiana University, of an infant chimpanzee and human baby learning to untie knots and performing other tests of their mental development. The two had been brought up together for nine months. The ape learned more rapidly, remembered longer, and for the first five months responded to more words than the boy. The superiority of the ape was probably due in large measure to her strictly human environment.

OTHER experiments, however, reported to the same meeting by Dr. Louis W. Gellermann, of Yale University, indicate that infants and apes do differ in reasoning ability even at that early age. One of the tests he gave in identical fashion to two babies and two chimpanzees was to distinguish between a triangle and a square in order to secure food. Human babies have greater ability to catch on to the relationship between the correct food box and the shape of the marker placed above it. The chatter of the babies as they puzzled over the boxes showed that they learn not alone by trial and error, but by thinking out the problem in words. Dr. Gellermann indicated that this superior ability to "verbalize" distinguishes the mentality of humans from that of apes.

Loss of the entire vision centers of the brain does not result in complete blindness, Dr. Donald G. Marquis, of Yale University, told his colleagues. It has been previously supposed that such a serious injury to the mechanism of vision would render the eyes completely useless. Dogs who have been so deprived of part of the brain have showed no evidence of sight when observed by ordinary methods. They bumped into walls and objects, made no response to food held or moved before their eyes, and did not blink at movements toward them. A new method employed by Dr. Marquis, however, demonstrated that the animals were still sensitive to light and could distinguish correctly between different intensities.

n

He trained the dogs to respond to certain degrees of brightness in a certain way, and found that they could distinguish these accurately. After the loss of the visual cortex, the habit was severely impaired, but was relearned in about the same time as that required originally.

A TEST to discover whether the high C of the coloratura soprano is called high because it actually seems high in space to the listener, was described by Dr. Forrest Lee Dimmick, of Hobart College. It has been suggested that the terms high and low as applied to musical notes have more than a purely figurative meaning. The experiment conducted by Dr. Dimmick did not confirm this suggestion, however. When listeners were asked to tell the height from which a sound was coming, they found it difficult if not quite impossible to detect the location. The pitch of the sound had no influence on the height guessed.

DR. MILTON METFESSEL, University of Southern California, reported that engineers can see the parts of a revolving motor as though they were standing still. Singers can test the pitch of their voice by watching a revolving phonograph disc. And this without any complicated apparatus. Such effects are produced through the principle of stroboscopy, applications of which already make possible the photography of rapidly whirling objects. A tuning fork held against the head will vibrate the eye in synchronism with the disc, making the eye function only at the time that the disc reaches a certain position. The whirling disc then appears at a standstill. Singers can learn to cause the eye blinding vibration with their voices, Dr. Metfessel said. A low or middle C will make the spokes of a disc turning at 80 revolutions per minute appear motionless.

TELESCOPE FOR THE McDONALD OBSERVATORY

THE giant 80-inch reflecting telescope projected for McDonald Observatory of the universities of Texas and Chicago, to be erected by 1938 on a Davis Mountain peak in Texas, will be the most powerful in the world for some purposes.

Dr. Otto Struve, director of Yerkes Observatory, who will also have charge of the new McDonald Observatory, explained recently that for the photography of faint nebulae and distant universes it will be as powerful as the 100-inch telescope on Mount Wilson, now the world's largest. For other special tasks it will be even more powerful.

"It is not, however, our intention to surpass the remarkable performance of the Mount Wilson telescope," Dr. Struve stated, "but rather do we hope to supplement it and to develop such features which, for one reason or another, are omitted at Mount Wilson. It is our desire to make our work supplementary to that of other institutions and to avoid duplication of any sort."

The concave mirror on which the starlight falls will be 80 inches in diameter, and the beam will be focused 27 feet above.

The mounting of the McDonald telescope will be similar to that of the 72-inch reflector at Victoria, B. C., and the 69-inch at the Perkins Observatory, Delaware, Ohio, with a long axis in the north and south line, supported between two concrete piers, and inclined at an angle equal to the latitude of the observatory. This turns from east to west once a day to compensate for the motion of the earth. Another axis at right angles to this, and supported in its middle, permits the instrument to move in a north and south direction. The new instrument will differ from those at Victoria and Delaware, however, in that it will be possible to bring the starlight, concentrated by the telescope, into a closed room of constant temperature where it can be analyzed by spectroscopes and other instruments capable of use only in a physical laboratory. Such instruments can not ordinarily be attached to the moving end of a telescope. A similar arrangement is possible with the two great telescopes at Mount Wilson.

Dr. Struve has listed the following problems which the new telescope is expected to attack: the study of the chemical composition of the atmosphere of the stars; the study of the properties of matter exposed to temperatures ranging from 3,000 to 50,000 degrees or more; the study of distant universes, which involves a test of the Einstein theory; the study of the composition of gaseous nebulae, of comets, planets, etc.

The new observatory is made possible by the bequest of the late William J. McDonald, of Paris, Texas, who died in 1926 and left to the University of Texas a fund now slightly in excess of \$840,000 for an astronomical observatory. The University of Texas will own the McDonald Observatory, but the University of Chicago will provide the staff. Its program will be coordinated with that of the present Yerkes Observatory.

THE ENZYME THEORY OF VIRUS DISEASE

EVIDENCE that the so-called "virus diseases" of plants and animals are caused by a non-living chemical substance that can attach itself to living matter, rather than by ultra-tiny living organisms, is claimed as the result of experiments on tobacco plants performed by Dr. Carl G. Vinson, of the University of Missouri. Dr. Vinson's work apparently supports the belief, held on theoretical grounds by many physiologists and pathologists during the past thirty years, that the causes of these mysterious diseases of plants and animals are compounds analogous to enzymes, the digestive and respiratory "ferments" of normal organisms, but malefic rather than beneficent in their effects.

Virus diseases afflict almost all plants. Their symptoms are such things as leaf mosaic, leaf curl and "yellows." Animals and man also have virus diseases; among them are smallpox, infantile paralysis and hog cholera. The causal agents of these diseases have never been positively identified as visible, and whatever they are they will pass through the pores of a stone filter and come out on the other side still virulent, which is something that ordinary disease germs, visible under a microscope, can not do.

Dr. Vinson's method of isolating the virus of tobacco mosaic was worked out during four years he spent at the Boyce Thompson Institute for Plant Research at Yonkers, N. Y., prior to coming to the University of Missouri. The first step was to freeze a quantity of mosaic-infested tobacco plants. Then the dead plants were put under heavy pressure, squeezing out their juice. Samples of this juice, filtered free of large particles, caused leaf mosaic when injected into healthy plants. The virus was thus evidently in the juice. The next step was to separate the juice into its various constituents, and find which of these could cause the disease and which could not. This Dr. Vinson did by adding acetone to the cold juice. This brought down a solid precipitate. The liquid left after precipitation could no longer cause the disease, but a solution of the precipitate could do so. The virus was thus evidently in the precipitate.

Dr. Vinson's further work has been in the greater refinement and purification of the precipitate, each step obtaining a more concentrated form of the virus. He states that analyses indicate its chemical make-up to be that of a protein or of some compound very similar to proteins. It is regarded as probable, however, that not the whole protein molecule is the real mischief-maker, but some relatively simple group of atoms that is attached to it or a part of it. Such an atom-group could conceivably attach itself to other protein molecules in healthy protoplasm, thus providing a mechanism of infection and propagation.

Dr. Vinson's work will of course be regarded agnostically by many of his colleagues, and all the results will be held provisional until the experiments are repeated and checked by other researchers. But if these checks confirm his theory, and extend it to apply to other virus diseases of both plants and animals, the effects of this research may well be very far-reaching. They will give a new physiological picture of many diseases that have hitherto baffled understanding, and perhaps pave the way for more effectual warfare against them.

ITEMS

ONE streamer of the sun's corona extended for at least three diameters from the sun at the time of the total eclipse on August 31. This is shown on a photograph taken by Dr. P. M. Millman, of Harvard College Observatory, with a short focus lens, an 88-second exposure and plates sensitive to infra-red or long-wave "heat" light. So far this is the longest extension reported by any observers of the recent eclipse.

No corpuscular eclipse was detected in radio tests in Newfoundland and Canada, Dr. A. S. Eve, of McGill University and chairman of the radio committee of the Canadian National Research Council, stated in a preliminary report of joint radio investigations during the total solar eclipse. British scientists had predicted the possibility of an effect on radio signals by an interruption of particles from the sun. Special radio eclipse expeditions to Vankleekhill and Cornerbrook, Newfoundland, both directed by Dr. J. T. Henderson, and to

Kingston, Ontario, under Dr. D. C. Rose, measured distinct losses in ionization of both Kennelly-Heaviside layers, E and F, during the time that the optical eclipse was visible. This supports the idea that the radio reflecting layers are caused by ultra-violet light from the sun. Tests by the Northern Electric Company showed no intensity change in five hundred meter signals between Ottawa and Montreal and the Canadian Marconi Company found no changes in 22 to 37 meter transatlantic waves.

THE radio reflecting layer of the earth's atmosphere that is about sixty miles above our heads is caused by radiation from the sun traveling with the speed of light. This tentative verdict, announced by Dr. Lyman J. Briggs, acting director of the U.S. Bureau of Standards, comes as the result of extensive radio tests during the eclipse. A rival theory advanced by British investigators attributed the formation of the ionized reflecting layer to particles shot out from the sun with much less speed than light. The Bureau of Standards' results uphold the idea that ultra-violet light and not solar particles are responsible. The critical frequency of the E or lower region of the Kennelly-Heaviside layer decreased approximately a thousand kilocycles during the eclipse, lagging behind phases of the eclipse by approximately five minutes. After return to normal no later effects were observed.

THE American method of prospecting for oil by airplane is being applied in Australia in an effort to locate a native supply of petroleum. All gasoline and oil used in Australia now must be imported, and consequently its price is high. A Royal Australian Air Force Survey Squadron has left for the Northern Territory where two planes will make surveys from a base at Darwin, on the coast. After the completion of this work, the expedition will move to Broome and then to Onslow in Western Australia. Other bases are to be occupied, and finally the coast will be surveyed between Adelaide and Melbourne. Thus the greater part of the parameter of the continent will be covered. The surveys have been arranged by Sir George Pearce, the minister for defense, and Dr. W. G. Woolnough, commonwealth geological adviser. Dr. Woolnough recently visited this country where he studied the use of airplanes as an aid in locating oil and was impressed by their effectiveness.

AIRPLANE pilots could rise to altitudes of fifty thousand feet, nearly ten miles, without danger of death from the rigorous experience if the nitrogen gas in their bodies is expelled before they leave earth by breathing oxygen for one hour before the ascent. Sir Leonard Hill, the eminent British physiologist, will so conclude in a communication to Nature, as the result of experiments on animals under low pressure conditions. Previous experiments in France had led to the conclusion that about 45,000 feet was the limit of altitude that can be reached by man with safety, even when oxygenequipped, unless his whole body is enclosed in a pressure chamber that shields him from the effects of the great height.

38

isde

ni 18-

oy at. J.

Now available

A Translation of the Modern

GATTERMAN

Laboratory Methods of Organic Chemistry

Completely revised by HEINRICH WIELAND

Translated from the Twenty-Second German Edition by W. McCARTNEY, Assistant in the Department of Medical Chemistry, University of Edinburgh

The New Content

- A, SOME GENERAL LABORATORY RULES
- B. ORGANIC ANALYTICAL METHODS
- C. PREPARATIVE PART

1. Replacement of Hydroxyl and Hydrogen by Halogen. Alcohols and Olefines. 2. Carboxylic Acids and Their Simple Derivatives. 3. Nitro-Compounds and Their Reduction Products. 4. Sulphonic Acids. 5. Aldehydes. 6. Phenols and Enols. Keto-Enol Tautomerism. 7. The Diazo-Compounds. 8. Quinonoid Compounds. 9. The Grignard and Friedel-Crafts Syntheses. Organic Radicles. 10. Heterocyclic Compounds. 11. Hydrogenation and Reduction. 12. Natural Products.

Cr. 8vo 416 pages \$3.50

THIS new translation of the famous German text embodies all the changes that have been made in eleven European editions. It is so different from the last English translation as to be practically a new book, modern in every detail of theory and practice. Broadened in scope to accommodate the new developments in the study of organic chemistry, it includes a great many more preparations than before, while the material on inorganic chemistry has been omitted altogether. Mechanically, the format has been greatly improved by an increase in page size, new type throughout, and a waterproof fabrikoid binding.

Published September 6, this book is at hand for use in fall classes. Place your order with your bookstore immediately.

MACMILLAN

60 Fifth Avenue

New York City

SCIENCE NEWS

Science Service, Washington, D. C.

THE LIFE CYCLE OF GERMS

THAT a metamorphosis or change in form is part of the regular life cycle of certain germs is suggested by the work of Alice C. Evans, senior bacteriologist of the U. S. Public Health Service, who has investigated germs cultivated from cases of encephalitis.

Germs belonging to the family of streptococci have been recovered from these cases. These are small round germs, well known to bacteriologists, and the cause of many diseases. They can not pass through the pores of fine filters. Investigating these germs, Miss Evans was astonished to find them change into the long narrow germs known to bacteriologists as rods. Also, she found that sometimes these germs were able to pass through fine-pored filters.

A few years ago, bacteriologists were certain they knew all about the lives and habits of the well-known germ families, like the streptococci. Some germs might be round and some straight, some reproduced by dividing or splitting and some by growing spores. But they all remained true to type all their lives.

In fact, bacteriologists were so sure of the stability of germ families that when they saw a rod-shaped germ growing in a family of round ones, they concluded that the rod was a contaminating organism that had gotten into the colony by mistake. For the most part they are right about this, but Miss Evans's studies led her to suggest that bacteriologists may for years have been seeing the rod-forms of round streptococci and mistaking them for contaminating organisms of another family.

Miss Evans thinks that the germs exist in the body either in the filterable form or in several different forms of bacteria. It is only with difficulty that the germs living in the body can adjust themselves to growing on artificial material outside the body. For the first few days after they have been transferred from the body to the artificial growth material, they waver from one form to another. But once they are established on ordinary culture material, one form or the other grows and multiplies indefinitely without variation.

The rod-shaped form of the germ that Miss Evans investigated was more virulent in animals than the familiar coccus form. However, she could not conclude that one or the other form was the cause of the disease in man.

THE FORMS OF BACTERIA

BACTERIA are made to live not merely a double life but a triple one, in the laboratory of Miss Agnes Quirk, of the U. S. Department of Agriculture. By suitable modifications of diet, she can at will make them visible or invisible, and she can make the visible forms develop two different kinds of colonies on the solid nutrient media that constitute their food.

There is a certain parallelism between Miss Quirk's work and that of Dr. Arthur I. Kendall, of the Northwestern University Medical School, Chicago. Last summer Dr. Kendall announced his ability to make bacteria

visible or invisible at will, using a special protein medium which he had developed. Miss Quirk controls the life forms of her bacteria without using an unusual type of food, but by controlling the acidity and alkalinity of the ordinary beef infusion broth and agar.

The bacteria which Miss Quirk was studying had a habit of forming spots of "colonies" of two different types, when cultivated in the laboratory. One colony type was smooth-surfaced, the other rough. Bacteriologists never knew why they did that. Miss Quirk found that she could produce either type at will from the same original stock, getting 100 per cent. "smooth" colonies on a poured agar plate when she left the culture medium chemically neutral, and 100 per cent. "rough" colonies when she made it acid.

She discovered further that the germs in "smooth" colonies are virulent and active, whereas those in "rough" colonies are less able to cause disease. She can convert either form into the other at will, merely by changing the acidity and physical state of its food.

The germs in both "smooth" and "rough" colonies are visible under the microscope; but it was found that at a certain stage of the growth of the smooth-type organism, it can produce a filterable form, which can be induced to pass through the pores of a close-grained porcelain cylinder, and, after a period of time, be developed again into the microscopically visible form, retaining the characteristic virulence and behavior of the parent strain. The bacteria used were those of two plant diseases; potato black rot and plant tumor.

The method for causing bacteria to produce at will "smooth" and "rough" colony forms in pure plate culture has been applied by Miss Quirk to thirteen plant pathogens and by Major James S. Simmons, of Walter Reed Hospital, to the Rawlin's strain of typhoid with success. The "smooth" and "rough" typhoid organisms were not tested for their pathogenic or antigenic properties.

It is believed that the technique for causing bacteria to assume a dual existence is applicable to many, if not all parasitic bacteria.

Miss Quirk believes that the invisible or filterable stage of the organism is reached during the transformation period of the smooth form to the rough form and that conditions can be imposed upon the organism to produce a filterable stage or invisible state and later be returned to the visible state.

CANYONS IN OCEAN BOTTOM OFF NEW ENGLAND

ir en di to is til

DR. Francis P. Shepard, department of geology, University of Illinois, and collaborator, U. S. Coast and Geodetic Survey, writes that a whole series of vast canyons, rivaling anything that the West has to offer, have been found in the bottom of the ocean off the New England coast by the U. S. Coast and Geodetic Survey during the season which has just closed. Corsair Gorge, which created something of a sensation a couple of years ago when it was first discovered, proves to be only one

feature in this new-found stupendous submarine land-

This summer it was decided to examine in much more detail some of the valleys in the Corsair Gorge neighborhood to see if they might be used as landmarks for navigators. The last survey revealed an area with such relief and irregularity that it dwarfs by comparison anything above water in eastern North America and must rival the grandest topographic features of the West. The area charted represents only the upper mile of the two-mile-high continental slope.

The preliminary contour map which has been drawn shows a series of steep-walled canyons cut thousands of feet deep into this escarpment. The least of these is deeper than the Yellowstone Canyon and the greatest must be comparable with the Grand Canyon of the Colorado.

Some geologists have attempted to show that submarine valleys are not the product of river erosion, but the valleys under discussion have every indication of a fluvial origin. They have the typical sinuous shape of river valleys, as well as the branching tributaries and the V-shaped cross sections characteristic of canyons cut by streams. Since the valley floors are traceable to depths of at least 7,000 feet, it is evident that during the valley-cutting stage New England must have been a plateau at least a mile and a half above sea-level.

The steepness of the canyon walls, probably exceeding 45 degrees in places, makes it appear very probable that they were cut in solid rock rather than in the soft sediments of the ocean floor. The finding of fragments of weakly cemented conglomerate on the wall of one canyon partially confirms their rocky nature. Unfortunately only a few samples were collected since the soundings were made by echoes using the "fathometer," and it takes a long time to get samples from deep water.

The outer portions of the valleys have hummocky topography suggestive of landslide accumulations. It seems probable that the sediments which were deposited in the inner valleys after they were submerged have been shaken loose and have slid out into the outer valleys where they lodged because of the decrease in gradient.

ROCK FORTS IN ALASKA

REPORTS of finding inaccessible rock fortresses in the sea, used by people of the Far North many centuries ago, are brought back from Kodiak Island, Alaska, by Dr. Aleš Hrdlička, of the U. S. National Museum.

Dr. Hrdlička's discovery reveals for the first time that inhabitants of the North in ancient times had to take extreme methods of protection, very much as Pueblo Indians in the Southwest entrenched themselves on mesa tops. The fortresses discovered in the North are rocky islets off Kodiak Island coast. On the flat summits of these high cliffs were found ruins of villages strategically placed by the ancient people who had some formidable enemy to fear, perhaps because they had enviable wealth in sea-otter skins.

Ascent of the cliffs to reach one of these abandoned villages was a real "mountain-goat climb." Not even

spade or camera could be carry with him. Yet the old inhabitants must have packed their supplies year after year up the weary ascent.

"Kodiak Island is a unique archeological site," said Dr. Hrdlička. "This island, neglected by archeologists, can be studied for a hundred years and continue to shed light on aboriginal America.

"The chief result of this year's work is the definite ascertainment that there lived on the island in the course of time two distinct types of people, one the old and one more recent. Just who the old people were is not yet certain. While slightly Eskimoid, their main resemblance is to the Indian.

"It has been argued that only the crudest elements of culture were brought into America, and that all the rest of the Indians' art and industry were developed in America. Yet, the deeper we dug into the older remains of Kodiak Island, the higher the type of culture we met. These oldest natives made beautifully shaped knives of slate. They made lamps from rounded pieces of hard basalt and granite, and weapons some of which are of types found for the first time in American archeology. Among the carvings of fossil ivory is a portrait of a man, so cleverly carved that it must take rank among the fine art of prehistoric America. It is a true portrait, not a mere representation of a man."

Petroglyphs, or picture writings on the rocks, were found in astonishing quantity. Science knows of no way to decipher these records of the ancient people, but there is much scientific interest in studying them. Dr. Hrdlička reports that Kodiak Island contains the richest and best collection of petroglyphs of any site north of Mexico.

ITEMS

Whales in Antarctic waters are being counted by scientific men aboard the Royal Research Ship, Discovery II, operating under the direction of the Falkland Islands Government. The Discovery II sailed recently from Melbourne, Australia. The data on whale numbers are intended for use in drawing up an international agreement to prevent the depletion of whale herds through over-killing.

Using an electrical telescope that automatically counts the cosmic rays, Drs. Thomas H. Johnson and J. C. Street, of the Bartol Research Foundation of the Franklin Institute, are observing night and day on the summit of Mount Washington, highest of the White Mountains, with an altitude of 6,288 feet. The effects of the earth's magnetic field on the directional distribution of the cosmic rays are being studied and thus far a slightly greater intensity of the cosmic rays in the magnetic meridian seems to have been found. Camden Cottage, a building left open during the winter for the shelter of hikers, is being used as an observatory at the summit through the courtesy of the Mount Washington Club. The scientific apparatus was carried to the top of the mountain by auto truck. Observations will continue until September 25.

The Journal of General Physiology

W. J. CROZIER

JOHN H. NORTHROP

W. J. V. OSTERHOUT

Contents of Volume 16, No. 1, September 20, 1932

- ABRAMSON, HAROLD A. Electrokinetic phenomena. IX. Electrophoresis and electroosmosis.
- THOMPSON, WILLIAM R. Studies in respirometry. I. A combined gas burette-interferometer respirometer.
- THOMPSON, WILLIAM R., and TENNANT, ROBERT. Studies in respirometry. II. In-fluence of infra-red radiation upon carbon dioxide respiration of Drosophila imagos in dry air.
- THOMPSON, WILLIAM R., and TENNANT, ROBERT. Studies in respirometry. III. An application of refractovolumetric respirometry to the observation of continuous respiratory changes in wet or dry systems.
- NORTHROP, JOHN H. Crystalline pepsin. IV. Hydrolysis and inactivation by acid.
- NORTHROP, JOHN H. Pepsin activity units and methods for determining peptic activity.
- ANSON, M. L., and MIRSKY, A. E. The estimation of pepsin with hemoglobin.

TANG, PEI-SUNG. Temperature characteristic for the anaerobic production of CO₂ by germinating seeds of Lupinus albus.

CASTLE, E. S. Dark adaptation and the dark

growth response of Phycomyces.
WOLF, ERNST. Pulsation frequency of the advisceral and abvisceral heart beats of Ciona intestinalis in relation to temperature. CLARKE, G. L., and WOLF, ERNST. The mech-

anisms of tropistic reactions and the strychnine effect in Daphnia.

HOWARD, EVELYN. Osmotic relationships in the hen's egg, as determined by colligative properties of yolk and white.

NAVEZ, A. E., and ROBINSON, T. W. Automatic recording of movements of plant organs.

NAVEZ, A. E., and ROBINSON, T. W. Geotropic curvature of Avena coleopticle.

BLINKS, L. R. Protoplasmic potentials in Halicystis. II. The effects of potassium on two species with different saps.

OSTERHOUT, W. J. V. The kinetics of penetra-tion. IV. Diffusion against a growing potential gradient in models.

SUBSCRIPTION PRICE PER YEAR (ONE VOLUME), \$5.00

PUBLISHED BI-MONTHLY BY

The Rockefeller Institute for Medical Research YORK AVENUE AND 66TH STREET NEW YORK, N. Y.

APPARATUS and REAGENTS

FOR LABORATORIES OF CHEMISTRY and BIOLOGY

Our new 1044-page catalogue illustrates and describes 11,814 Apparatus items and lists 2,762 Reagent items, all controlled in quality, currently priced and stocked for immediate shipment.

ARTHUR H. THOMAS CO.

WEST WASHINGTON SQUARE

PHILADELPHIA, U. S. A. Cable Address, BALANCE, Philadelphia

MARINE BIOLOGICAL LABORATORY



Zoology Specimens Botany Specimens and Mounts Protozoan and Drosophila Cultures

Microscopic Slides Live Marine Aquaria

> Catalogues on request Supply Department

Woods Hole, Mass.

U. S. A.



THE WISTAR INSTITUTE BIBLIOGRAPHIC SERVICE

AUTHORS' ABSTRACTS

of all papers appearing in the journals listed below prior to publication of the articles in full.
By this advance information biologists may familiarize themselves with contemporary research in a minimum of

Advance Abstract Sheets are issued twice a month, each sheet containing ten or more authors' abstracts.

Subscription rate is \$3.00 per year.

Bibliographic Service Cards, following the Advance Abstract Sheets, also are issued twice a month. In addition to the authors' abstracts, the cards provide subject headings and complete bibliographic reference. The cards are convenient for filing and library records. Price, \$5.00 per year.

At regular intervals the authors' abstracts are assembled and published in book form with complete authors' and analytical subject indices. Price, \$5.00 per volume. Liberal discount to subscribers to the Bibliographic Service Cards.

JOURNAL OF MORPHOLOGY THE JOURNAL OF COMPARATIVE NEUROLOGY THE AMERICAN JOURNAL OF ANATOMY THE AMERICAN JOURNAL OF ANATOMY
THE ANATOMICAL RECORD
THE JOURNAL OF EXPERIMENTAL ZOÖLOGY
AMERICAN ANATOMICAL MEMOIRS
AMERICAN JOURNAL OF PHYSICAL ANTHROPOLOGY
JOURNAL OF CELLULAR AND COMPARATIVE PHYSIOLOGY
FOLIA ANATOMICA JAPONICA (Tokyo, Japan)
PHYSIOLOGICAL ZOÖLOGY (Chicago, Illinois)
STAIN TECHNOLOGY (Geneva, New York)
ECOLOGICAL MONOGRAPHS (Durham, North Carolina)

The Wistar Institute of Anatomy and Biology Philadelphia, Pa., U. S. A.

APPARATUS and REAGENTS

FOR LABORATORIES OF CHEMISTRY and BIOLOGY

Our new 1044-page catalogue illustrates and describes 11,814 Apparatus items and lists 2,762 Reagent items, all controlled in quality, currently priced and stocked for immediate shipment.

ARTHUR H. THOMAS CO.

WEST WASHINGTON SQUARE

PHILADELPHIA, U. S. A. Cable Address, BALANCE, Philadelphia



Field Equipment for Engineers, Explorers, Hunters, Travelers Scientific Instruments, Packing Equipment, Skis, Firearms, Clothing, Fiala Pat. Sleeping Bags, Optical Instruments, Astronomic Telescopes, Range Finders, Binoculars. Paulin Altimeters. Write for Catalog "A" FIALA OUTFITS

47 Warren St., New York

THE SCIENCE PRESS PRINTING CO.

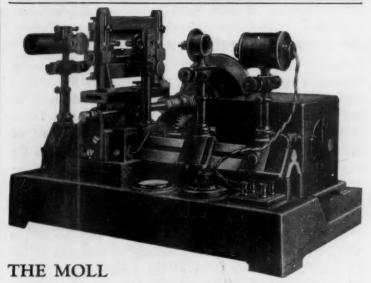
PRINTERS OF

SCIENTIFIC AND EDUCATIONAL JOURNALS, MONOGRAPHS AND BOOKS

Correspondence Invited

LANCASTER.

PENNSYLVANIA



RECORDING MICROPHOTOMETER

For rapidly and accurately recording the intensity of photographed spectra.

By special arrangement with Kipp & Zonen, we import apparatus of their manufacture and are in position to be of definite service to our customers by relieving them of all details incident to shipping and customs formalities.

Descriptive literature will be sent on request.

JAMES G. BIDDLE CO.

ELECTRICAL AND SCIENTIFIC INSTRUMENTS

MARINE BIOLOGICAL LABORATORY



Zoology Specimens Botany Specimens and Mounts

Protozoan and Drosophila Cultures Microscopic Slides Live Marine Aquaria

> Catalogues on request Supply Department

Woods Hole, Mass.

U. S. A.



POCKET PRISM \$37.50 Stereoscopic pocket 8 power, 10 gLASSES

While we make a specialty of small, light-weight, Galileo and Prism pocket binoculars from \$5 upward, we carry all makes and sizes in new and

used instruments; also microscopes.

Satisfaction guaranteed or money refunded; send for price-list and discount to students and institutions.

Vest pocket Mirakel 7 power monoculars \$9.50; 25 power telescope \$15.50.

J. Alden Loring Box 8 OWEGO, N.Y.

SCIENCE NEWS

Science Service, Washington, D. C.

THE DIRECTION OF COSMIC RAYS

Cosmic rays smash into the earth's atmosphere more frequently from the magnetic north and the south than from the east and the west, experiments made both at the Bartol Research Foundation of the Franklin Institute, Swarthmore, Pennsylvania, and on the summit of Mount Washington, by Dr. T. H. Johnson, assistant director, and Dr. J. C. Street, seem to indicate. In a report to the American Physical Society, Drs. Johnson and Street will give their evidence for this variation of the cosmic ray intensity with azimuth.

Extensive experiments are in progress throughout the world by physicists of many nations in attempts to determine the characteristics of the cosmic rays. Early experiments by Dr. R. A. Millikan were interpreted as showing that the cosmic rays bombarded the earth with equal intensity from all directions. Dr. Millikan is now conducting further tests in various parts of the country and Canada. Dr. A. H. Compton, of the University of Chicago, who has just traveled from the Orient to the Arctic making cosmic ray observations, found that cosmic rays were stronger with increasing distance north and south of the earth's equator.

If the experiments of Drs. Johnson and Street, which are still in progress, continue to indicate this difference they will fall in line with those of Dr. Compton and support to a greater extent the theory that cosmic rays are particles capable of being deflected by a magnetic field rather than very short radiation like light, x-rays or gamma rays.

The Johnson-Street experiments measure the intensity of the cosmic rays at an angle of 30 degrees with the vertical in the magnetic north, south, east and west directions.

Three Geiger-Mueller counters are being used as a telescope and each cosmic ray has to pass through each counter in succession before it is received. At Swarthmore, where the latitude is 40 degrees north, the first measurements indicate that the cosmic rays are 5 to 10 per cent. more intense in the north and south directions than in the east and west directions. This difference lies just outside of the probable error of the measurement, which means that it is more likely than not that the effect is a real one.

Tests on the summit of Mount Washington, 6,288 feet high, are now in progress. A special portable cosmic ray laboratory was transported to the summit by auto truck and Drs. Johnson and Street are engaged in two weeks of observations.

ORIGIN OF THE PLANETS

A NEW nebular hypothesis of planetary origins is being discussed at Amsterdam as a substitute for the theory that the planets are fragments torn from the sun by the enormous tidal forces generated when another huge star passed too close to the sun. The new evidence against the "tidal forces" theory is based on observations and calculations made and reported by H. P. Berlage, Jr., of the Meteorological Observatory in Batavia, Java. His paper was communicated to the Royal Academy of Sciences by Professor H. A. Kramers.

Berlage's theory is that the planets had their origin in a nebula surrounding the sun and having the shape of a thin, flat disk. From what is known of the way in which the present planets differ in their respective densities it follows that if there actually was such a nebula it must have had this disk shape at least as far out from the sun as Neptune. Moreover, the densities for each planet, calculated on the assumption that the new theory is correct, agree remarkably well with the actual known densities. For example, according to the theory, the greatest density should be along a circle which is nearly the same as the earth's orbit. The earth is actually the most dense of the planets.

Additional supporting evidence is found in the distances of the planets from the sun. Careful examination of the known facts about these distances reveals that the figures agree much better than has ever been believed with the positions which the planets should occupy, according to this theory, with respect to the sun.

If the planets did originate from a great disk-shaped nebula, it is easy to understand the presence of the great bulk of planetoids between Mars and Jupiter; they arose from an unstable and highly turbulent zone in the gaseous disk. Even the puzzling arrangement of these planetoids can be simply explained on the proposed basis.

If the theory is correct, there should have been another, lesser zone of turbulence, and so there should be another family of planetoids. It is considered probable that the recent discovery of Pluto brought to light the first known member of such a group of planetoids, thus giving the theory added confirmation; and it is suggested that if these planetoids are discovered, they might appropriately be called plutoids.

A FOUR-LEGGED FISH

DR. LAUGE KOCH, Danish geologist, who brought home from Greenland fossils of a "four-legged fish" that stands as a connecting link between water-dwelling and land-dwelling vertebrates, made his find as an incident in a sweepingly planned and comprehensive survey of the great mysterious frozen sub-continent that has been undertaken by the Danish Government. So important is this work deemed by its official sponsors that the bureau which has it in charge ranks almost as a separate portfolio in the cabinet, and Dr. Koch, though not actually a cabinet member, rates practically as one in Copenhagen.

The survey, which has been in progress for several years, will, when completed, tell the whole scientific story of Greenland, its geography, its climate, its geology and mineral resources, its oceanography and fisheries, its plant, animal and human inhabitants.

The "four-legged fish," or Stegocephalians, whose fossils form a part of Dr. Koch's collections, have been known to geologists for many years. They were not really fish, but true amphibians, possessing, however, a number of fishlike characteristics. Their Greek name means "roof-headed," and refers to the complete covering of bony plates with which their heads were protected. They were among the earliest forerunners of the frog-toad-salamander family.

There are, however, genuine fish that are also genuinely "four-legged"—that is, their fore-and-aft paired fins are modified in such a way that they can crawl as well as swim with them. Such fish are found as fossils among the earliest vertebrate-bearing rock strata, and two or three species still survive in the muddy rivers of the semi-arid parts of Africa and Australia. These are the Dipnoi, or lung-fishes. The African lung-fish can get oxygen only by means of its "lung," or modified swim-bladder; if it is forcibly kept completely under water for many hours, so that it can not come to the surface to gulp air, it suffocates—literally drowns. These lung-fish form mud-crusted cocoons during the dry season, and "aestivate" just as bears or woodchucks hibernate.

There are numerous fish that are able to come ashore, and do habitually climb out of the water in search of food. They are found mostly in the tropics, and many tall tales are told about them. These fish, however, are not "four-legged"; only their forward paired fins are of use in locomotion. They are, moreover, not air breathers, but carry enough water behind their gill-covers to keep their gills moist until they are ready to return to the water.

PARROT FEVER

DR. CHARLES ARMSTRONG, surgeon of the U. S. Public Health Service, has donated some of his blood for convalescent serum to be used in treating Mrs. William E. Borah, wife of Senator Borah of Idaho, who is suffering from psittacosis or parrot fever. The serum was sent from Washington to Boise, Idaho, by airplane. Dr. Armstrong was one of the early victims of the disease on the staff of the U.S. National Institute of Health when that institution investigated the parrot fever outbreak of 1929-1930. He was sent to investigate the first cases in Annapolis, Maryland, and subsequently contracted the disease himself. He was critically ill, but after several weeks recovered and continued the federal investigation of the epidemic. Dr. Armstrong at first withheld publication of his name as the donor of serum for Mrs. Borah, just as he at first tried to prevent publication of the fact that he had nearly become a martyr to the disease he was investigating in 1930.

Psittacosis has occurred frequently in the United States ever since the outbreak in 1929-1930. Public health officials now think there is an epidemic focus of infection in the country, that is, a place where the infection always exists and from which it may spread.

Their theory is that the focus exists where love birds or parakeets are raised in the United States and that the sporadic cases reported from time to time come from this focus and not from imported birds. The U. S. Public Health Service hopes to be able to obtain money for an investigation of this focus.

Psittacosis or parrot fever is often mistaken for influenza or other common diseases because of its unfamiliarity and the similarity of its symptoms to better known maladies. Older persons are more seriously affected by it than young ones. The exact manner in which the disease is spread is not known.

A RESPIRATION FERMENT

A SECOND respiration ferment, one that is not the haemin which controls the conveyance of oxygen from the lungs to the muscles and other tissues of the body, has been found by Professor Otto Warburg, Nobel Prize winner, and his associate, Dr. Walter Christian, of the Kaiser Wilhelm Institute for Biology in Berlin.

Professor Warburg's demonstration of the constitution and action of haemin was one of the significant contributions that won him the Nobel Prize in medicine and physiology in 1931. Now he describes in a preliminary report to *Die Naturwissenschaften* his discovery of this second oxygen-carrying ferment.

Professor Warburg and Dr. Christian found that when certain cells, called anaerobic because they normally can not live in the presence of oxygen, are shaken up with oxygen, a respiration or burning of carbohydrate takes place. This respiration or breathing can not be stopped by carbon monoxide or by hydrocyanic acid, poisons which stop ordinary respiration in animals by acting upon the haemin that controls the conveyance of oxygen in the body.

Juices squeezed out of many other cells behave like anaerobes. In such juices the Berlin investigators also found respiration which can not be stopped by either carbon monoxide or hydrocyanic acid. From these observations they concluded that an oxygen-carrying ferment other than haemin is to be found in nature.

The second respiration ferment appears to be present in high concentrations in anaerobic cells. It is an orange colored substance that breaks down when heated for ten minutes at a temperature of 60 degrees Centigrade. Professor Warburg and Dr. Christian described its absorption spectrum and the other physical and chemical properties which they had observed.

THE FOREST FIRE SITUATION IN CALIFORNIA

CALIFORNIA is the only National Forest area that is causing the U. S. Forest Service really acute concern over fire danger. Although the 160,000-acre brush fire that threatened a part of the vital watershed area of Southern California has been brought under control, there is a great deal of potential kindling all over the state. No rain has fallen for months, and none is in sight. For this reason National Forest Region No. 5, which is the only such region made up of a single state,

is marked as "very unfavorable" in the Forest Service's latest summary.

"Unfavorable" regions include numbers 3, 4 and 5, ranging from Washington on the north to New Mexico on the southeast. Here drought conditions are in general bad, but not as bad as they have been in California. In Regions 1 and 2, which take in the northern and central Rockies and the Plains states east to the Missouri, conditions are listed as favorable. Favorable also are conditions in Region 9, comprising the upper Mississippi and Great Lakes states. Here there have been few fires, and on the whole adequate rains.

In the East and South, Region 7, taking in all the seaboard states from Maine through Florida to Texas, is listed as "unfavorable." Through much of this territory there has been a severe late-summer drought, and hundreds of short-lived but quick-running fires have had to be fought.

There have been more than 5,000 forest fires throughout the country during the current year. Of these, approximately 40 per cent. have been caused by smokers, campers, steam-engines and other human agencies. The rest are due mainly to lightning. Man-caused fires predominate in the East, accounting for over 90 per cent. of the total. In the West, lightning is the more frequent cause of forest fires.

On the whole, 1932 has not been a bad forest fire year, with the sole exception of California. Its total was about two sevenths lower than the 1925-29 average to the same date.

ITEMS

A TINY planet, probably not over ten miles in diameter, that makes a trip in its orbit around the sun in 2.023 years, has been discovered independently by American and Russian astronomers. Of the 1,500 or more of these asteroids that revolve in the space between the orbits of Mars and Jupiter, only two encircle the sun in shorter periods, according to calculations made by Dr. A. Kahrstedt, of the staff of the Astronomisches Recheninstitut at Berlin-Dahlem. Though the first observation of the asteroid to reach the Recheninstitut was made on August 4 by Dr. G. Neujmin, at the branch of the Russian Central Observatory at Simeis, in the Crimea, it was found previously by Dr. George Van Biesbroeck, of the Yerkes Observatory in Wisconsin, who first recorded it on July 30.

ARTIFICIAL fever, which has been helpful in treating paresis, is now being turned to the treatment of another ailment, chronic asthma. Thirty cases of the disease in which relief was obtained by this means have been reported to the American Medical Association by Drs. Samuel M. Feinberg, Strafford L. Osborne and Meyer J. Steinberg, of Northwestern University Medical School, Chicago. In nineteen of these patients the relief of symptoms was complete and lasted from several days to nine and one half months. In the other eleven cases, there was improvement without complete remission of the symptoms.

CHAULMOOGRA oil, used in the treatment of leprosy, is being tried as a remedy for tuberculosis induced experimentally in guinea-pigs. Good results in checking the course of the disease are reported by the investigators, Dr. Erik Ohlsson and G. Glimstedt, of the Agricultural High School at Alnarp, Sweden. The experiments are still in progress and the authors point out that it would be unjustifiable and objectionable to try the method on human beings before the investigations on animals have been definitely concluded.

BACTERIAL wilt of corn, a disease that as a rule does not assume serious proportions, has been doing material damage during the past season, according to a report made by the U. S. Department of Agriculture. In Illinois, it has so seriously damaged fields of sweet corn planted for the canneries that many of them were plowed up and replanted to other crops while the corn was still young. It also caused serious trouble in dent corn. New England sweet corn fields were damaged, some of them to the extent of 25 or 30 per cent.

CALIFORNIA'S sugar pines, an important timber resource, are threatened with the blister rust disease that has made white pine planting a doubtfully profitable enterprise in the East, and has already invaded the natural white pine forests of the Pacific Northwest. H. G. Lachmund and J. R. Hansbrough, of the U. S. Bureau of Plant Industry, with headquarters at Portland, Oregon, have confirmed the high susceptibility of sugar pine to blister rust, in a series of experiments in which an isolated group of young trees were exposed to the disease. Their results will be reported in the forthcoming issue of *The Journal of Forestry*.

NORTHERN Norwegians have been Norwegians ever since the Stone Age, according to a statement made by Professor A. W. Brögger, Norse archeologist, in a recent lecture in London. His investigations have shown a continuous culture, with no evidence of new racial additions, from the time the first Germanic settlers went into the country on the heels of the retreating glaciers of the Ice Age. He has traced the story of his countrymen through stone, bronze and early iron ages. Throughout their long history, they have been what they are to-day: farmers on the land and sailors, especially whalers, at sea.

College students each have on the average three colds a year. Members of families living at home, however, have only about half a cold a year, or one every two years. The figures are from a study of the incidence and time distribution of common colds just published by the U. S. Public Health Service. The study was made by Dr. Wade H. Frost, of the Johns Hopkins School of Hygiene and Public Health, and Mary Gover, associate statistician of the U. S. Public Health Service. The higher incidence of colds in college students might be due to conditions of student life, or might be due to more accurate reporting on the part of the students.

New books and new editions

in the physical and biological sciences—

medical economics-

THE CRISIS IN HOSPITAL FINANCE

By MICHAEL M. DAVIS and C. RUFUS ROREM

Today's problems of hospital finance and experimentation leading to their solution are discussed here from the points of view of the physician, the public, and the hospital administrator. \$2.50

neurology-

THE THINKING MACHINE

Revised edition, 1932

By C. Judson Herrick

A popular account of how the brain works. Dr. Herrick finds the evidence clear that the brain works by as natural a biologic process as muscles contract. In his revision he takes cognizance of the latest neurological research.

geology-

A DESCRIPTIVE PETROGRAPHY OF THE IGNEOUS ROCKS

By ALBERT JOHANNSEN

Volume II just published. The most comprehensive textbook on petrography in English. Volume II defines the rock families and traces the history of the terms. Both megascopic and microscopic characteristics are given. Volume I, \$4.50 Volume II, \$5.50

mathematics-

PROJECTIVE DIFFERENTIAL GEOMETRY OF CURVES AND SURFACES

By ERNEST P. LANE

An exposition of research coordinating the American and Italian schools. Contains new results hitherto unpublished. \$4.00

botany-

METHODS IN PLANT HISTOLOGY

Revised edition, 1932

By Charles J. Chamberlain

In the fifth edition of this popular text directions for collecting material have been amplified, and directions for fixing, hydrating, and staining have been improved. Various new methods for sectioning are treated in detail.

\$3.25

The University of Chicago Press

SCIENCE NEWS

Science Service, Washington, D. C.

KRYPTON CHLORIDE

KRYPTON, one of the rare gases that form a small percentage of the air, has been forced into its first known chemical union by three physicists of the Chemical Institute at Bonn—Drs. A. von Antropoff, K. Weil and H. Frauenhof. This is rated as a scientific triumph, for the rare gases are all exceedingly inert chemically, and under ordinary circumstances do not unite with other elements at all. Only one of them, helium, now well known because of its use in airships, has been driven into chemical activity by several English physicists.

The Bonn experimenters produced what seems to be krypton chloride by a combination of low pressure, low temperature and electric discharge. They circulated krypton gas by means of a pump, keeping the pressure at approximately one to five per cent. of ordinary atmospheric pressure, and maintaining a low temperature with liquid air. As the gas was circulated through a glass tube it was subjected to an electric discharge, and at the same time chlorine gas was introduced.

The pressure within the tube fell, indicating a decrease in the number of the gas molecules present, and therefore the probable combination of the two elements to form a compound with a smaller number of larger molecules. At the same time a dark-red substance appeared, which the investigators take to be the krypton chloride compound.

A similar fall in pressure was recorded when bromine was used instead of its chemical relative chlorine, indicating the possibility of the formation of a second compound, krypton bromide.

"Control" experiments, in which one or the other of the conditions of the main experiment was omitted, or in which argon, another rare gas, was substituted for the krypton, yielded only negative results.

Their preliminary results have been reported by the German scientific periodical *Die Naturwissenschaften*. The researches are being continued and a detailed account will be published in the near future.

LIFE EXPECTATION OF MACHINERY

AFTER more than fifteen years of research, investigators connected with the Iowa Engineering Experiment Station have succeeded in establishing mathematical laws describing the mortality data for many kinds of physical property, according to Professor Edwin B. Kurtz, head of the department of electrical engineering at the University of Iowa, and Robley Winfrey, editor on the experiment station staff. Assisted by Professor G. W. Snedecor and Professor A. E. Brandt, of the department of mathematics at the Iowa State College, these men have announced results of research on life characteristics of physical property which will permit engineering valuations and depreciation allowances for many kinds of industrial equipment to be made with accuracy hitherto unattainable.

Just as life insurance actuaries make mass studies of

human mortality records, so mass studies of the service lives of such physical equipment as passenger automobiles, waterworks pumps, incandescent lamps, crossties, disc harrows and freight cars can be made.

Among the records studied by Professor Kurtz are data extracted from public utility valuation reports, publications of such organizations as the American Waterworks Association, the Illuminating Engineers' Society and the Forest Products Laboratories, and reports of the North German and Prussian telegraph systems as far back as 1852.

Mathematical equations descriptive of thirteen type mortality curves have been obtained for sixty-five separate property groups in such industries as water supply, telephone and telegraph, electric service, steam and electric railways, motor vehicles and agricultural implements.

These mortality studies are not restricted to "death" rates alone in the service lives of the equipment units involved. Professors Snedecor and Brandt have made use of sets of curves and equations due to the English biometrician, Professor Karl Pearson, enabling them to compute extensive tables which serve to answer questions relating to the average life of industrial units. Such tables could be employed in the determination of proper premium rates for "life" insurance policies on the effective working lives of industrial equipment of all kinds, under methods altogether comparable to those used by human-life insurance companies. The equations, graphs and tables will give cost accountants more accurate estimates of depreciation than have previously been possible. The considerable amount added to knowledge of mass probabilities will permit replacement schedules for many industrial organizations to be prepared with greater exactness and resulting economy. Kurtz believes that these studies constitute only the beginning of far-reaching and comprehensive investigations which he looks forward to seeing greatly advanced.

STREPTOCOCCI GERMS

ALTHOUGH the germs known as haemolytic streptococci cause diseases as various as scarlet fever, erysipelas, pneumonia, heart disease, puerperal fever after child-birth, and sepsis after accident or surgical operation, and as secondary invaders, moreover, kill multitudes by giving a fatal end to temporary weakness, the identification of given streptococci with particular varieties of disease is very difficult.

Sir Frederick Andrewes, for many years until his death last February a member of the Medical Research Council, devoted the last working years of his life to promoting advance in this direction, hoping by using the most refined methods of analysis to improve the classification of the streptococci. The Medical Research Council has just issued the report of the work carried on during more than seven years by him and his collaborators, Miss Lettice Digby and Mrs. Ethel M. Christie, which concludes with the statement that "the more one studies Haemo-

Macmillan Announces

A timely volume by distinguished scientists on a subject of vital importance

ALCOHOL AND MAN

The Effects of Alcohol on Man In Health and Disease

EDITOR

HAVEN EMERSON, M.D.

De Lamar Institute of Public Health,
Columbia University

Associate Editors

HENRY A. CHRISTIAN, M.D. Harvard University

REID HUNT, M.D.

Harvard University

ARTHUR HUNTER, LL.D., F.A.S.

N. Y. Life Insurance Company

CHARLES C. LIEB, M.D. Columbia University

WALTER R. MILES, Ph.D. Yale University

ERNEST G. STILLMAN, M.D.

Rockefeller Institute for Medical Research

TABLE OF CONTENTS

Part I

The Effects of Alcohol on Human Functions

Part II

The Effects of Alcohol on the Cell and in Heredity

Part III

Alcohol as a Poison and as a Medicine

Part IV

Alcohol and Body Resistance and Pathology

Part V

The Effect of Alcohol on Man's Conduct and Mentality

Part VI

Alcohol and Longevity, Mortality and Morbidity

Excerpt from the preface

"The editorial group responsible for this volume in collaboration with colleagues in the medical and associated sciences found themselves in hearty agreement to the effect that education in the basic facts about alcohol was essential to the best interest of modern man and his social organization, whether or not legislation was to be a permanent factor in determining the extent to which commerce in beverage alcohol was to be permitted."

The scientific facts speak for themselves.

Write for full information to

THE MACMILLAN COMPANY

60 Fifth Avenue

New York

lytic streptococci the more strongly is the impression gained that they are in a state of constant flux in which it is difficult to find any firm foundation for a permanent systematic classification."

It seems that these particular bacteria have such inherent powers of adaptation to their chemical environment that the very methods used for discrimination between forms of different origin may themselves bring change to the characters of the organisms under observation. The worker may find himself at first identifying an apparently distinctive type of streptococcus as being associated with a certain form of disease, and later discover by more critical work that it was his own methods that produced the type characters on which he first depended.

The serious and many-sided danger of the haemolytic streptococcus to human life seems to arise from the very instability of its physico-chemical behavior, for the organism as an invading parasite seems to have special facility in adapting the refinements of its living chemistry to the particular host environment in which it finds itself. Studies of different "types" in terms of formal definition become fruitless or meaningless, the Medical Research Council points out, if each type is a passing chemical phase quickly assumed and readily abandoned. Progress would seem to lie in gaining deeper knowledge of the exact chemical events involved in the interplay of the parasitic organism and the environment of the invaded host.

CAUSE OF THE INCREASE IN CANCER DEATHS

THE increase in cancer is real and is due to two factors. In the first place, more people are escaping the hazards of youthful diseases and are living to the age at which cancer attacks. Second, and even more important, more of these people who live to the so-called cancer age are being saved from dying of other diseases, such as pneumonia, which formerly took a large toll at the cancer age.

These conclusions, based on a study of Canadian vital statistics, were reached by Dr. Madge Thurlow Macklin, of the University of Western Ontario Medical School. They were made public in *The American Journal of Cancer*.

Dr. Macklin compared death rates from cancer and from all causes in Canada at various age levels since 1901. She found that as public health measures decreased the prevalence of preventable diseases, like small-pox, yellow fever, malaria, diphtheria and tuberculosis, the age of the population changed. More people now live to be over forty years than did in 1901. At the same time the cancer deaths increased, not only in the general population but in the older age groups.

Dr. Macklin is of the opinion that the cancer rate might justifiably be used as an index of the state of preventive medicine and sanitation in a country. Those with good public health organizations have a high cancer rate; those with a low cancer rate show poor public health facilities. Not only does preventive medicine

bring more people to the cancer age, but it keeps them from dying of preventable causes after they get there, so that it is inevitable that the death rate from some few diseases, not preventable at present, will mount.

That Dr. Macklin is not unduly discouraged by her findings is evident from a concluding sentence, the philosophy of which should prevent people in general from taking a too gloomy view of the situation. "We must all die of something," she pointed out, "and it is inevitable, as we eliminate one cause of death after another, that we increase the death rate from the causes that remain, for while we may increase the length of life, we do not decrease the certainty of death."

While Dr. Macklin's conclusions are based on Canadian statistics, she believes that a similar analysis of the statistics of other countries would lead to the same conclusions.

THE PREVENTION OF PSITTACOSIS

Don't make friends with any parrots, love birds or parakeets from California unless they have a certificate from a health officer declaring them free from parrot fever. This warning has been issued by Surgeon-General Hugh S. Cumming, of the U. S. Public Health Service. It is intended to protect people from psittacosis, or parrot fever. If they fail to heed the warning, they run a good chance of getting this serious, often fatal disease.

Some of the breeding aviaries of Southern California, where birds of the parrot family are raised, are infected with psittacosis, an officer of the U.S. Public Health Service found in a study undertaken at the invitation of the California State Department of Public Health. Birds from these aviaries may be apt to give the disease to unsuspecting bird owners and friends.

So to protect the health of people all over the country the surgeon-general has issued his warning. But he has done more than warn. Upon his advice, Secretary of the Treasury Mills has now limited the interstate transportation of birds of the parrot family by common carriers to those birds certified by the proper health authority of the state as coming from aviaries free from infection. Bootlegging of the birds is expected, however, so Surgeon-General Cumming warns against buying or handling any strange bird.

Out in Southern California, and particularly in Los Angeles, these birds are often raised in private families by ladies wishing to make pin money. Many of the birds are peddled from house to house in flivvers. One case of psittacosis in Oregon was traced to a California love bird sold in this way.

The restrictions on importation of parrots and related birds from outside the United States remain in force. These were put into effect shortly after the serious outbreak of parrot fever in 1929–1930. Many of these cases were traced to parrots and love birds imported from South America. Under present regulations, an individual returning from abroad may bring in no more than five such birds, but commercial shipments of birds must be held fifteen days at U. S. quarantine stations for

PUBLICATIONS ARNOLD ARBORETUM of HARVARD UNIVERSITY

Journal of the Arnold Arboretum of Harvard University.

An illustrated journal dealing with taxonomy, cytology and plant pathology chiefly in reference to ligneous plants.

Subscription \$3.00 per year; beginning with vol. XIV (1933) \$4.00 per year. Single copies

Contributions from the Arnold Arboretum of Harvard University.

A series of longer papers with the subject matter similar to that in the Journal, issued at irregular intervals; each paper priced separately.

- No. 1. THE HYPODERMATACEAE OF CONIFERS. By G. D. Darker. 131 pp. 27 pl. \$3.00.
- No. 2. TAXONOMY AND GEOGRAPHICAL DISTRIBU-TION OF THE GENUS MILESIA. By J. H. Faull. (In press.)
- No. 3. STUDIES IN THE BORAGINACEAE, IX. By I. M. Johnston. (In preparation.)

Address

THE ARNOLD ARBORETUM, Jamaica Plain, Mass.

S. A. Mitchell's **ECLIPSES** OF THE SUN

is now published in a third, completely revised edition including an account of all scientific data discovered prior to the August 31st eclipse Profusely illustrated Price, \$5.00 Astronomers all know of it. "It's the only modern work on the subject for the layman"—The New Republic Available in Braille Columbia University Press, 2960 Broadway, New York, N. Y.

THE WISTAR INSTITUTE BIBLIOGRAPHIC SERVICE

AUTHORS' ABSTRACTS

of all papers appearing in the journals listed below prior to publication of the articles in full. By this advance information biologists may familiarize themselves with contemporary research in a minimum of

Advance Abstract Sheets are issued twice a month, each sheet containing ten or more authors' abstracts. Subscription rate is \$3.00 per year.

Bibliographic Service Cards, following the Advance Abstract Sheets, also are issued twice a month. In addition to the authors' abstracts, the cards provide subject headings and complete bibliographic reference. The cards are convenient for filing and library records. Price, \$5.00 per year.

At regular intervals the authors' abstracts are assembled and published in book form with complete authors' and analytical subject indices. Price, \$5.00 per volume. Liberal discount to subscribers to the Bibliographic Service Cards.

JOURNAL OF MORPHOLOGY
THE JOURNAL OF COMPARATIVE NEUROLOGY
THE AMERICAN JOURNAL OF ANATOMY
THE AMATOMICAL RECORD
THE JOURNAL OF EXPERIMENTAL ZOÖLOGY
AMERICAN ANATOMICAL MEMOIRS
AMERICAN JOURNAL OF PHYSICAL ANTHROPOLOGY
JOURNAL OF CELLULAR AND COMPARATIVE PHYSIOLOGY
FOLIA ANATOMICA JAPONICA (Tokyo, Japan)
PHYSIOLOGICAL ZOÖLOGY (Chicago, Illinois)
STAIN TECHNOLOGY (Geneva, New York)
ECOLOGICAL MONOGRAPHS (DURHAM, North Carolina) JOURNAL OF MORPHOLOGY

The Wistar Institute of Anatomy and Biology Philadelphia, Pa., U. S. A.

NEW (15th) EDITION OF

THE MICROSCOPE

By SIMON HENRY GAGE

Revised throughout, and a wholly new chapter on the Ultra-Violet Microscope. Price, \$4.00.

THE COMSTOCK PUBLISHING CO., Ithaca, N. Y.

Microscopes and Accessories

Photomicrographic and Projection Apparatus Leica Camera- Prismatic Field Glasses

E. LEITZ, Inc.,

Dept. 173, 60 East 10th Street

New York, N. Y.

Stylograph is a wax sensitized paper for graphic recordings. It marks with any sharp point and does not rub off like smoked paper.

THE STYLOGRAPH CORPORATION

Scottsville Road

Rochester, New York



Field Equipment for Engineers, Explorers, Hunters, Travelers

Scientific Instruments, Packing Equipment, Skis, Firearms, Clothing, Fiala Pat. Sleeping Bags, Optical Instruments, Astronomic Telescopes, Range Finders, Binoculars.

Paulin Altimeters. Write for Catalog "A" FIALA OUTFITS

47 Warren St., New York

observation. Provision for the condition in which the birds are kept during the voyage, relating to space, air, sanitation, etc., also is made in the import regulations.

AUTUMN LEAF COLORS

GORGEOUS autumnal colors in woods and along roadsides are due to two general classes of chemical compounds in the aging leaves: carotinoids and anthocyanins. The carotinoids are responsible for the yellows and the anthocyanins for the reds and purples.

Dr. Charles E. Sando, of the U. S. Department of Agriculture, has summarized the process by which leaves turn from green to gay, when promises of frost begin to cool the air. Carotinoid pigments are present in all leaves, but are masked most of the time by the more abundant green coloring matter, chlorophyl. Chlorophyl is always being both formed and destroyed in leaves, but in autumn destruction goes on faster than formation, finally reducing it to a low point which permits the yellow carotinoids to be seen. If no other masking pigment is present, such leaves become pure yellow or orange, like tulip-tree, willow and sassafras.

The other class of pigments, the anthocyanins, are dissolved in the cell sap. With the exception of a few purple-leaved or bronze-leaved plants, these pigments are also concealed by the more abundant chlorophyl, and show themselves only when it has been sufficiently broken down. At the same time, certain changes in the carbohydrate content of the leaves may cause an actual increase in the amount of the anthocyanins present. Thus we get the strong reds and purples of sumac, blackberry, sweet-gum, oaks, etc.

Trees like maples, which sometimes show a gorgeous mottling of yellows and reds, may have local patches of anthocyanins masking the carotinoid ground-color.

ITEMS

THE earthquake that worked ruin in various Greek towns on September 26 originated under the Aegean Sea a little distance off the coast, according to calculations made by the U. S. Coast and Geodetic Survey, based on data received by Science Service from a number of seismological observatories. The approximate location of the epicenter was in latitude 39.5 degrees north, longitude 24 degrees east, and the time of origin was 2: 20.6 P. M., eastern standard time. All instrumental records, according to the Coast and Geodetic Survey, indicated an earthquake of terrific violence.

Brooks's comet, a periodic visitor to the vicinity of the sun, last seen in 1925, was sighted by Professor George Van Biesbroeck, of the Yerkes Observatory, the astronomical clearing house at Harvard College Observatory has been notified by telegraph. It has reappeared in the heavens very close to the place that has been predicted for it from its past history. On September 25, the comet was in the constellation of Pisces, which is in the southeastern evening sky. With a magnitude of 12, it is too faint to be seen without a fair sized telescope and its past history indicates that it will not become visible to the unaided eye.

HEALTH officials are not alarmed over the infantile paralysis situation this season. While Philadelphia and adjacent territory has suffered a sharp outbreak, there has been only the expected seasonal increase in the rest of the country. More than half the cases reported to the U. S. Public Health Service for the entire country for the week of September 24 were from Pennsylvania, which reported 156 cases. Of these, 65 were reported from Philadelphia. The total reported for the United States was 293. Last week's total was 286 for the country, 145 for Pennsylvania and 112 from Philadelphia. These figures indicate that the outbreak in that locality is on the wane. In neighboring New Jersey there has been a slight increase from 40 cases for the week of September 17 to 51 for the week of the 24th. This was the only state besides Pennsylvania reporting a large number of cases of the disease.

X-ray photographs of insects, believed to be the first ever made, have been taken at the Biological Laboratory at Cold Spring Harbor, New York, by Dr. Hugo Fricke and Irwin Sizer. They were made with a specially constructed x-ray tube, using small plates such as dentists use. The pictures show many scientifically interesting details of the internal structure of insects, and it is believed that this new method can be used to advantage by students of insect life.

CANCER may be linked with permanent changes in cell centrosomes rather than with abnormal behavior of chromosomes, in the opinion of Mrs. Margaret Reed Lewis and Dr. Warren H. Lewis, of the Carnegie Institution of Washington and the Johns Hopkins Medical School. The studies on which this opinion is based were made with the aid of a special moving picture camera devised by Dr. Lewis, and are made public in the current issue of the American Journal of Cancer. Investigators have held for some time that the difference between cancer cells and normal cells lay in the abnormal multiplication of the cancer cells. By studying moving pictures of the actual process of cell multiplication, in both normal and cancer cells, it is hoped to throw light on this phase of the problem.

THE Freudian theory that all children tend to prefer the parent of the opposite sex failed of confirmation in a study conducted by Dr. John E. Anderson, of the University of Minnesota, reported to the Southern Society for Philosophy and Psychology and published in The Psychological Bulletin. Dr. Anderson sent questionnaires to the parents of 3,178 children, of whom 1,626 were boys. They revealed that there are no outstanding sex differences at any age level in attachment for parents. About half of both girls and boys have no favorites in the household. Of the others, there is a slight tendency for both boys and girls to prefer the mother; this tendency decreases with age. Jealousy is displayed more often when the mother shows affection to another child than under any other circumstances. Jealousy decreases with age and is somewhat more likely to be present in girls than in boys.

New Lea & Febiger Text-books

Just Ready . New Work

Just Ready

Experimental Pharmacology and Toxicology

A Selected Laboratory Course

By HENRY G. BARBOUR, A.B., M.D. Yale University, New Haven, Conn.

12mo, 141 pages, interleaved, illustrated Limp binding, \$2.75, net

HIS selected laboratory course is based on twenty years of successful experience and is restricted to the limited time usually allotted. Every experiment is suitable for the beginner, neither expensive nor elaborate apparatus is required, and the clinical bearings are indicated throughout.

Internal Medicine ITS THEORY AND PRACTICE

In Contributions by American Authors

Edited by JOHN H. MUSSER

B.S., M.D., F.A.C.P.

Professor of Medicine in the Tulane University of Louisiana School of Medicine, New Orleans, La.

Octavo, 1316 pages, illustrated Cloth, \$10.00, net

WENTY-SEVEN recognized authorities, each holding a professorial position in a prominent medical school, contribute to this work. It will give the student an authoritative source of information and help him to acquire a grasp of the present-day conception of disease.

LEA& FEBIGER

Please send me books checked:

Barbour's Pharmacology

10.00

Musser's Internal Medicine ...

(S. 10-14-32)

Washington Square PHILADELPHIA

☐ New Catalogue

Address

TURTOX NEWS

Free to Biology Teachers

Turtox News is published monthly by the General Biological Supply House and is mailed without charge to Biology teachers in High Schools and Colleges of the United States and other countries. Recent issues have contained the following articles in addition to announcements of new developments for the Biology laboratory:

Practical Suggestions for Embryological Technique.

The Use of Lantern Slides in Teaching Biology.

Notes on the Collecting and Preserving of Some of the More Common Mosses. Earth An Album of Pressed Forests.



The Sign of the Turtox Pledges Absolute Satisfaction

If you are not now receiving Turtox News ask to have your name placed on our mailing list. Please be sure to give us your teaching address.

GENERAL BIOLOGICAL SUPPLY HOUSE

Incorporated

761-763 East Sixty-ninth Place CHICAGO

01

T

W

po

fie

on

N

to

sn

ph

kin

dr

ca

hu

de

be

ne

ma

 F_0

pe

we

the

Eu

hor

SCIENCE NEWS

Science Service, Washington, D. C.

DR. DYER'S WORK ON TYPHUS FEVER

Final proof that rat fleas transmit typhus fever in the United States was achieved by Dr. R. E. Dyer and his associates, of the U. S. Public Health Service, after months of work on the problem. In the midst of further investigations of the question, such as whether lice also may carry the American variety of the disease, and whether a newly developed vaccine will protect people against it, Dr. Dyer, senior member and leader of the research group, has been stricken with the disease.

Typhus fever in the Old World, called jail fever and ship fever, because it was often found in jails, ships, slums and wherever people lived in conditions of filth, is carried by the body louse. It is a very serious, highly fatal disease. In the United States, however, the disease appears to be much milder, rarely causes death, and has never reached serious epidemic proportions as it has in Europe. The fact that the disease occurred in people who were not infested with lice led American investigators to suspect that some other insect was transmitting it.

Dr. Dyer, with Drs. A. S. Rumreich and L. F. Badger, of the U. S. National Institute of Health, investigated cases of typhus which occurred on premises in the immediate vicinity of food-handling establishments in Baltimore in the late summer and fall of 1930. They found these premises heavily infested with rats. These animals were trapped and combed for fleas. About three dozen fleas were obtained from the rats and their nests.

The fleas were ground up and the emulsion injected into guinea-pigs, which contracted a disease like typhus fever. The clinical symptoms and the appearance of the organs and tissues corresponded with the symptoms and signs in guinea-pigs that had been inoculated with a strain of American or New World typhus fever.

Guinea-pigs which had recovered from an attack of endemic typhus produced by the New World strain were apparently immune to subsequent inoculation with the strain obtained from the flea emulsion.

Further studies led Dr. Dyer-to suggest that rats may be an important reservoir of typhus fever throughout the world and not alone in the United States. "It seems a reasonable hypothesis that epidemics of louse-borne typhus may have their origin from cases of typhus transmitted from rat to man by rat fleas."

In the studies to determine whether lice may transmit the American variety of the disease, Dr. Dyer and his assistant, Dr. W. E. Workman, went about for three weeks with 200 active lice strapped to their legs below the knee. They were trying to establish a colony of body lice for their work. Finding that the lice were rather particular as to their food and greatly preferred a diet of human blood, these intrepid scientific men volunteered to furnish the ideal diet for their experimental objects.

One of Dr. Dyer's first assignments after becoming a member of the staff of the U. S. Public Health Service

in 1916, was to control bubonic plague in New Orleans. He has also made investigations on pellagra and on Rocky Mountain spotted fever. In the latter research, he showed for the first time that the disease frequently appeared in eastern United States, where it had been mistaken for typhus fever. He has also done research on scarlet fever and established the national unit for scarlet fever antitoxin.

MOUNT WASHINGTON WEATHER STATION

A WEATHER station on Mount Washington, N. H., which has the reputation of being the windiest spot outside the "Home of the Blizzard" in the Antarctic, opened on October 12 to record the gales, blizzards and quieter moods of the weather on this highest point in New England. Already the snows have begun, and there is no prospect that the observers will lead an easy life this winter.

The party that is attempting this arduous task is up there for the fun of it, but not simply to live there through the winter, though this in itself will be quite a trick. They will undertake to maintain a first order station and send out, twice daily, radio reports. They will also make many experiments in radio transmission.

In charge is Joseph B. Dodge, of the Appalachian Mountain Club, well known to all visitors at Pinkham Notch as the genial and capable manager of the club's hut system. Mr. Dodge, who has his home at Pinkham Notch at the base of Tuckerman Ravine, will be a frequent visitor to the station on the summit, and will maintain a fully equipped weather station at the base. The base station should provide many interesting comparisons of wind and temperature with the top. Those who will live on the summit are seasoned mountaineers. R. S. Monahan spent several weeks on Alaska's icy mountains this summer with Bradford Washburn's Mount Fayerweather party. Alexander A. Mackenzie, radio enthusiast, has been hutmastering at Pinkham Notch for the Appalachian Mountain Club. S. Pagliuca, electrical engineer, is thoroughly familiar with the White Mountains, and last summer was in charge of the Galehead Hut of the Appalachian Mountain Club system.

The New Hampshire Academy of Sciences is sponsoring the expedition and the Blue Hill Observatory, of Harvard University, is supplying most of the weather instruments and supervising the meteorological program. The U. S. Weather Bureau is also lending apparatus, as are likewise many individuals and firms. Fuel and food are being donated or supplied at wholesale prices by different companies.

To obtain a weather record on a wind-swept summit is not easy, and for wind velocity and snowfall usually difficult. Anemometers will go round so long as they are not covered with ice. But how is an anemometer to be kept clear when the wind is building frostwork from cloud particles at a rate of one to six feet in a single

night? The answer will probably be found in a heated anemometer, which the Blue Hill Observatory is constructing.

Snow falls so slowly that strong winds drive the flakes almost parallel to the surface of a mountain, up one side, across the top and down the other. Therefore, a cylindrical gauge with the usual horizontal receiver may catch only a little that may swirl into it. The rest is dumped into one of the ravines. Shielded gauges, with receivers parallel to the mountain slopes, will be constructed out of furnace piping and placed at various points on and around the summit.

To the summit of Mount Washington, altitude 6,288 feet, there have been transported, in addition to instruments, coal, food and other material, ten cylinders of hydrogen weighing 1,300 pounds that will be used during the winter to inflate 225 meteorological sounding balloons.

NEWLY FOUND ELEPHANT FOSSILS

FIVE teeth and several bone fragments of the woolly mammoth, the largest single find of this huge Ice-Age mammal ever made in the East, have been discovered on a golf course near Philadelphia, and were placed on display at the Academy of Natural Sciences on October 9.

The fossils were found by a workman during the course of steam-shovel excavation for a new water hazard. They were buried four feet under ground. The teeth weigh from three and a quarter to six and three quarters pounds each, and are in a good state of preservation.

Edgar B. Howard, of the academy's museum, identified the specimens as belonging to *Elephas primigenius*, one of three species of genuine elephants that roamed North America during and immediately after the Pleisfocene, or glacial period. Although this species was the smallest of the three, it was still huge, the beasts averaging nearly ten feet high at the shoulders, with tremendous curving tusks bigger than those of any living elephant. It was protected against the cold by a thick coat of wool, overhung with long shaggy hair.

When this great animal lived in North America, its kindred were hunted by cave men in Europe, who also drew and sculptured their likenesses on the walls of their caverns and on ivory of their own tusks. Whether such hunters existed also on this continent has not yet been definitely determined.

OLD DRINKING HORNS

DRIED-UP heeltaps of beer and mead in two ancient drinking horns have yielded secrets of ancient German beverages, under the microscope of Professor Dr. Johannes Grüss, of Friedrichshaven. Professor Grüss summarizes his study in the German scientific magazine Forschungen und Fortschritte.

The two horns were found buried eight feet deep in a peat bog in northern Germany. They have zoological as well as archeological interest, for they were made from the horns of the once abundant but now almost extinct European bison.

Lurking in their cracks and under the scaled flakes of horn, Professor Grüss found dried remains of the dregs of liquors quaffed in the far-gone days when German warriors drank as mightily by night as they fought by day. He scraped out the dried and hardened remains, soaked them up and patiently examined them under his microscope.

One horn had been used for beer, the other for mead, the evidence showed. The beer horn contained starch and protein cells from emmer, a species of wheat, together with yeast cells and fungus spores. The discovery of emmer fragments is of importance, for although it has long been conjectured that the ancient Germans used this grain in their beer positive proof has not hitherto been brought to light. Emmer was used with barley in making the beer-like beverages of ancient Mesopotamia and Egypt.

Mead was a fermented drink made of a honey solution. The mead horn yielded numbers of pollen grains, of flower species visited by bees, together with the end of a bee's tongue. Mead was fermented mainly by a wild yeast found in flowers, and cells of this yeast were abundant in the scrapings which Professor Grüss got out of the mead horn.

ITEMS

VITAMIN D, in the form of an extract of cod-liver oil so potent that ten drops are of equal vitamin D value with three teaspoonfuls of standard cod-liver oil, is now available to the medical profession. This natural vitamin D is not an irradiated product and not a cod-liver oil concentrate, but an extract of the rickets-preventing principle of the oil. It is stated to be free from objectionable taste. The new product was developed by Professor Theodore F. Zucker, of the College of Physicians and Surgeons at Columbia University, and the privilege of distributing it through regular medical channels has been licensed to the S. M. A. Corporation. This firm is already distributing the recently isolated primary vitamin A, and expects soon to have a combination of A and D to offer for medical use.

INDIUM, metal so extremely rare that its price at present is ten times that of platinum, is becoming available in larger quantity. New ore sources have been discovered in America, and these, together with older known deposits in Germany, yield enough raw material to encourage expectations that the annual output of the finished metal, of 99.9 per cent. purity, will soon reach five kilograms, or a little over ten pounds. Because it has hitherto been scarce almost to the point of unobtainability, the possible uses of indium are still practically unknown. But with ten pounds a year in sight, chemists are looking forward to possible researches on it.

ABSOLUTE zero, the completely cold point at which all temperature ceases, is only sever tenths of a degree beyond the reach of physics now. Absolute zero is 273 degrees Centigrade below the freezing point of water; and Professor W. H. Keesom, of the University of Leyden, has succeeded in producing a temperature of minus 272.3 degrees. This was done by keeping a small quantity of liquid helium constantly stirred while a high vacuum was produced over it by means of a pair of powerful mercury pumps.

THE STANDARD WHITE RAT

Mus Norvegicus Albinus

Depression Prices

At the instance and desire of Drs. McCoy, Roth & Lake, and Professor Voegtlin & Dr. Smith, U.S.P.H.S., National Institute of Health (Formerly Hygienic Laboratory), Washington: Macallum, Synthetic Drug Co., Limited, Toronto, (Canada): Hooper, Metz, Albany: Payne, Upjohn Co., Kalamazoo: The Diarsenol Company, Buffalo: Schamberg & Kolmer, Research Institute of Cutaneous Medicine, Philadelphia: Clarke, Parke, Davis & Co., Detroit: Githens, H. K. Mulford Co., Philadelphia: Chamberlain, Mallinckrodt Chemical Works, St. Louis: Clowes, Eli Lilly & Co., Indianapolis: Armour & Co., Research Laboratory, Chicago: Hynson, Westcott & Dunning, Baltimore: De Pree Laboratories, Holland: New York Intravenous Laboratory, New York: U. S. Army Medical Center, Walter Reed Hospital, Washington: U. S. Quarantine Station, U.S.P.H.S., Staten Island, New York: Fortress Monroe, Va., and Gallops Island, Boston Harbor: Department of the Interior, Bureau of Mines, Exp. Station, Pittsburgh, Pa.: Departmento, National de Hygene, Institute Bacteriologico, Buenos Aires, Rep. Argentina: Texas Agricultural Exp. Station, A & M. College of Texas: Georgia Experiment Station, Experiment, Georgia: The Universities of California, Oregon, Colorado, Nebraska, Minnesota, Wisconsin, Michigan, Kansas, Illinois, Georgia, Arkansas, Kentucky, North Carolina, Pennsylvania, Pittsburgh, Louisville and Toronto: College of Physicians and Surgeons (Columbia): Brown, Yale, Harvard, Cornell, Johns Hopkins, Columbia, McGill, Western, Ohio State, Indiana, Western Reserve, Baylor and Vanderbilt Universities: Wellesley, Mount Holyoke, Smith, Pennsylvania State, Iowa State, Michigan Agricultural & Carleton Colleges: The Medical College of Virginia: The Rockefeller Institute, New York: The Stout Institute, Menomonie: The Physicatric Institute, Morristown: The Insulin Committee, York: The Stout Institute, Menomonie: The Physiatric Institute, Morristown: The Insulin Committee, York: The Stout Institute, Menomonie: The Physiatric Institute, Morristown: The Insulin Committee, U. of Toronto, Toronto, Canada: Wood, Institute of Cancer Research (Columbia), New York: Mendel Laboratory of Physiological Chemistry (Yale), New Haven: Park, Abel, Ulrich & Hegner, Johns Hopkins, Baltimore: Powers, School of Medicine (Yale), New Haven: Gamble, Harvard Medical School, Boston: Loevenhart, Medical School (Wisconsin), Madison: Walker, Union Memorial Hospital, Baltimore: Luce, Strong Memorial Hospital, (U. of R.), Rochester: Krumbhaar, Philadelphia General Hospital, and Laird, State Laboratory, (U. of P.), Philadelphia: Conservation Bureau, City of Boston: Dennison, Lakeside Hospital, Cleveland: United Israel-Zion Hospital, Brooklyn: Wear, American Car & Foundry Co. Berwick: The Fleischmann Co. The Dry Milk Co. and Lehn & Fink, Inc. New York: & Foundry Co., Berwick: The Fleischmann Co., The Dry Milk Co., and Lehn & Fink, Inc., New York: Vitamin Food Co., Westfield: Postum Cereal Co., Kellogg Co. and The Battle Creek Sanitarium, Battle Creek: Eastman Kodak Co., Rochester: Mead Johnson Co., Evansville: Crane Ohio Ice Cream Co., Columbus: Moorman Mfg. Co., Quincy, et al., this office and colony has tried (and succeeded for twelve years), to Breed, Raise and Market, a perfectly healthy Albino Rat, actively growing, and absolutely free from disease, constitutional, infectious, contagious or parasitic, at the lowest price possible with a fair return for the service rendered, thus establishing a common source of supply for the governmental (testing and experimental) laboratories and ALL the manufacturers and research laboratories, and thereby enabling competent biologists, working in different parts of the country, to obtain comparable—or coincident—results.

REFERENCE TO ANY OF THE ABOVE MENTIONED PERSONS OR LABORATORIES WILL CONFIRM THESE STATEMENTS; THIS OFFICE AND COLONY IN MOST OF THE CASES CITED, FURNISHING THEIR ENTIRE SUPPLY.

Wholesale Prices—Delivered—Prepaid—Via Railway Express (Shipping Days: Tuesday and Wednesday)

Orders not booked for lots of less than 50, except Breeders and Large booked for 25 and Pregnant Females for 15. Where delivery costs (including cratage and drayage at \$1.50 per crate) exceed \$5.00 Per C. excess amount is charged at cost on invoice. Ten per cent. additional will be charged where known age is specified (except litters): or sex other than mixed (M & F) (except breeding stock): or where different weights are specified than those tabulated below: or where maximum-minimum range of weights desired is less than 20 grams. It is understood that when mixed sexes—(M & F), are ordered, this office reserves the right to determine the proportion of sex: whether all of one: all of the other, or the proportion of each. Females, ordered as such, furnished only in breeding stock. Instead of four regular litters, the Males of eight litters, ear-marked, with four foster mothers will be furnished if desired.

	LD PR	ICE	NEW
BREEDING STOCK—GRADE "A"—M & F-100-200 Gms. " "F-PREGNANT, UNTIMED		Per C	\$100 150
LITTERS—KNOWN AGE—COMPOSITE—Males from 8 litters, ear-marked with	300		100
four foster mothers	150	**	75
LITTERS-KNOWN AGE 10 Young with Dam: Mothers and Young counted alike			
and charged at rate of 50 cents each: NOT LESS THAN 4 LITTERS SHIPPED	100	86	50
EX. LARGE STOCK-M & F-200-500 GmsUnknown Age	70	44	30
LARGE STOCK-M & F -150-200 " " "	65	44	30
TOXICITY STOCK—M & F -100-150 " " "	75	46	35
MEDIUM STOCK—M & F — 80-100 " " "	70	66	35
SMALL STOCK—M & F — 50-80 " " "	65	48	30
VITAMINE STOCK—M & F — 30-50 " " "	60	88	30

RETAIL PRICES ADD 50% TO ABOVE QUOTATIONS FOR SMALLER LOTS THAN SPECIFIED IN WHOLESALE LIST. NO TRANSPORTATION ALLOWANCE. DELIVERY COSTS, INCLUDING EXPRESS CHARGES, DRAYAGE AND CRATAGE, ARE CHARGED AT COST ON INVOICES.

ERNEST V. B. DOUREDOURE, Laboratory Supplies

(OFFICE) 134 W. MAPLEWOOD AVENUE, GERMANTOWN, PHILADELPHIA, PA.

Telephone—Germantown 7446

PLEASE NOTE THAT THESE PRICES ARE JUST ONE HALF OF THOSE CHARGED PRIOR TO THE DEPRESSION. WITH SUCH PRICES, THERE IS SMALL NEED TO POSTPONE IMPORTANT EXPERIMENTS, DUE TO CURTAILMENT OF INCOME.

LATEST BOOKS McGRAW-HILL

Hardy and Perrin-The Principles of Optics

By Arthur C. Hardy, Associate Professor of Optics and Photography, Massachusetts Institute of Technology, and Fred H. Perrin, Instructor in Physics, Massachusetts Institute of Technology. International Series in Physics. 645 pages, 6 x 9, illustrated.

This text seeks to provide a solid foundation for those who have chosen optics as a career, and at the same time to furnish an adequate knowledge of the subject for those who intend to specialize in other branches of physics or engineering.

Bacher and Goudsmit—Atomic Energy States As Derived from the Analyses of Optical Spectra

Compiled by Robert F. Bacher, National Research Fellow, and Samuel Goudsmit, Professor of Physics, University of Michigan. International Series in Physics. 600 pages, 6 x 9. \$6.00

This is the most complete compilation of data yet published on energy states of the atom. All spectroscopists, students of spectra and physicists generally will find in these tables a wealth of material with which to test and build theories of atomic structures and radiation.

Radin-Social Anthropology

By Paul Radin, Lecturer in Anthropology, University of California; Sometime Lecturer in Anthropology, Cambridge University. *McGraw-Hill Publications in Sociology*. 444 pages, 6 x 9. \$3.50

A strictly scientific text, avoiding theories, generalizations and bias. Those students in other fields who realize the bearing of anthropology on their subject will find the book especially illuminating. The text is the first written in this country giving equal prominence to non-American and American tribes.

Kells-Elementary Differential Equations

By Lyman M. Kells, Assistant Professor of Mathematics at the U. S. Naval Academy. 193 pages, $5\frac{1}{2} \times 8$. \$2.00

Simple, concise, this treatise presents the fundamental types of differential equations, together with many illustrative examples and graded problems of each type. Stress is laid on the numerous applications, in large measure designed to meet the needs of the engineering student.

Logsdon-Elementary Mathematical Analysis, Vol. I

By Mayme Irwin Logsdon, Associate Professor of Mathematics, The University of Chicago. 258 pages, 6 x 9. \$2.25

Here, in a new and logical manner, trigonometry, college algebra and analytical geometry are woven into a harmonious whole. Vol. I covers the work of one semester. With Vol. II, which will appear in December, it is intended as a survey course in freshman mathematics.

Sinnott and Dunn—Principles of Genetics A Textbook, with Problems

By Edmund W. Sinnott, Professor of Botany, Barnard College, Columbia University, and L. C. Dunn, Professor of Zoölogy, Columbia University. McGraw-Hill Publications in the Agricultural and Botanical Sciences. 457 pages, 6 x 9, illustrated. \$3.50

This well-known textbook has been thoroughly revised and brought up to date. Much new material has been added, notably (1) a discussion of the important contributions of genetics to evolutionary theory, and (2) an analysis of the relations between genetics and the problems of development.

Send for copies on approval

McGRAW-HILL BOOK COMPANY, Inc.

McGraw-Hill Building

330 West 42nd Street

New York

SCIENCE NEWS

Science Service, Washington, D. C.

DISINTEGRATION OF THE LITHIUM ATOM

Using atomic bullets speeding with the energy of over 700,000 electron-volts, Professor E. O. Lawrence, of the University of California, and his associates, Dr. Livingston and Milton G. White, have succeeded in smashing the lithium atom into two alpha particles or ionized atoms of helium gas.

Professor Lawrence thus confirms work done by British physicists who used lower energy protons as the bombarding projectiles. They found that protons shot at the lithium atoms combined with them and released energy.

A special apparatus that imparts high energies to atomic particles by whirling them in a magnetic field was used in the investigation. With this machine, designed by Professor Lawrence and Dr. Livingston, serving as a source of proton bullets or hydrogen atom nuclei endowed with high energies, a crystal of lithium fluoride was bombarded with a stream of some ten billion of these sub-atomic bullets per second.

In the first test, proton bullets with energies of 360,000 volt-electrons were used. Then the energy of these tiny projectiles was raised to 510,000 volt-electrons, and finally to 710,000 volt-electrons. In each case the number of lithium atoms disintegrating under the bombardment was obtained by counting the helium ions which shot out of the crystal. The number of disintegrating atoms increased as the energy of the proton bullets was increased.

Because of equipment now on hand, Professor Lawrence and his associates believe they are in a position to carry these disintegration experiments to a further point than has yet been possible. The machine now in use is capable of producing protons with energies as high as 1,200,000 volt-electrons. Although this is a higher limit of energy than has ever been officially reported, Professor Lawrence says that he has a larger machine of the same type which will record a still higher limit of energy. This machine, which contains one of the world's largest magnets, is now producing hydrogen molecule ions with an energy of 3,600,000 volt-electrons.

The highest energies previously reported were those obtained in the Department of Terrestrial Magnetism of the Carnegie Institute of Washington. The limit was about 1,000,000 volt-electrons, and the number of protons with this energy was very small. In comparison, the University of California machines produce projectiles at the rate of about ten billion per second, and reach energies well over one million volt-electrons.

With such means available it is believed that it will be possible to blast apart any atom in the table of chemical elements. This will in effect open a new field of physics, and far-reaching discoveries may be anticipated in the future.

A NEW VARIETY OF BEET

"U. S. No. 1" is the name of a sugar-beet—a new variety produced by the plant breeders of the U. S.

Department of Agriculture to strike the first heavy blow at the curly-top disease which is a grave menace to the whole western beet-sugar industry and at present actually affects seriously one third of the total acreage planted to sugar-beets.

"U. S. No. 1" has a high degree of resistance to curly-top, and, although it is expected that better varieties will be produced in the future, it is believed that this one is good enough to justify extensive planting. Test plantings have shown the new variety to produce from twelve to eighteen tons an acre, while commercial varieties grown in comparison yielded from seven to fourteen tons. The new beet produced from 4,189 to 6,185 pounds gross sugar an acre and the others from 2,755 to 4,738 pounds.

It is planned to have all the seed of "U. S. No. 1" grown in this country, thus establishing an extensive new American industry, and at the same time enabling the Department of Agriculture to exercise effective supervision over it. In the western beet-sugar areas, seed is distributed by the contracting manufacturers to the farmers who grow the crop, so that the handling of the new variety will be that much easier. No seed is available for general distribution. It is expected that enough seed for the entire acreage now infested with curly-top will be available by 1934.

Curly-top is a disease that causes the leaves of beets to curl up, and hence to lose much of their efficiency as food factories. It is caused by a filtrable virus, one of the class of still-mysterious living things that can pass through the pores of a fine porcelain filter without loss of virulence. The virus is carried by leaf-hopper insects, which live on wild vegetation in canyons near the beet fields during off seasons. While plant breeders have been devising a defense in the form of the disease-resistant new variety, entomologists have been studying plans of attack that will carry the warfare into the enemy's country, to reduce the number of leaf-hoppers that annually invade the beet fields.

THE DIESEL ENGINE

ne ra; loc tor

Co

cal

vai

"(

the

149

cou

Ka

une

wit

Thi

Col

tha

fror

copi

THE installation of the world's largest Diesel engine at Copenhagen is being watched by engineers everywhere because it is the latest and one of the most important events in a possible industrial revolution. Its successful and economical operation will mean the wider use of crude oil as automobile and airplane fuel and as the source of energy for the generation of electricity.

Rudolph Diesel's invention has many advantages to recommend it. Compared with the conventional automobile and airplane power plant, its lack of an ignition system and use of cheap, practically non-inflammable oil instead of gasoline are important.

In Europe, where gasoline is costly, the Diesel engine is already used as the power plant for many trucks and buses, but in America, with gasoline cheaper, its application to the automotive field has not been so rapid. The Cummins Diesel automobile has been one of the foremost

35

ve

ıg

il-

SS

ts,

ek

to

de

ine

ere

int

the

ito-

and

developments in this country. It competed in the racing classic at Indianapolis and finished with reasonable success.

America is also witnessing the development of the Diesel airplane engine which has been largely fostered by the Packard Company. The weight per horsepower has been reduced to a figure comparable with that for gasoline and the advantage of non-inflammability of fuel was unfortunately illustrated by a fatal accident. Captain L. M. Woolson, the Packard engine's designer, was killed in a crash during a fog in his Diesel-powered plane, but the ship did not eatch fire. Authorities agreed that, had gasoline been used, the plane would have been immediately consumed by flames.

The Diesel was initially a heavy engine, and its widest application is as a marine and stationary power plant. But research has consistently reduced its weight. Because of the Diesel's small size and lightness compared with steam boilers and turbines, the new German "pocket battleships" are propelled by such engines, which were specially built much lighter than most marine Diesels. Europe has a number of large Diesels in stationary power plants, one of which is a 15,000 brake-horsepower engine in the Hamburg Power Station. Seven thousand horsepower is America's largest, installed at Vernon, California.

Engineers are continually debating the range of usefulness of the Diesel engine and most of them agree that in its present form it can be economically operated as a subordinate source of power under many different conditions.

MAP BY COLUMBUS

A COPY of a map made by Columbus in 1498, the original of which vanished long ago, has been found in a Constantinople museum. It is described by Professor Paul Kahle, of the University of Bonn, in Forschungen und Fortschritte.

The copy appears as part of a large world map made by the Turkish geographer and navigator, Piri Re'is, dated March, 1513. The lands of the Old World are derived from other early maps, but when it came to the newly discovered lands across the Atlantic the cartographer depended entirely on Columbus. The islands are located as he described them, and the names on the towns and physiographic features are those used by Columbus. This part of the map, moreover, is specifically ascribed by its maker to "Colonbo," which is a variant by only one letter from his original Italian name, "Colombo," the one-letter shift being due, perhaps, to the Spanish rendition of his name as "Colon."

In an endeavor to account for a copy of Columbus's 1498 map being in the hands of the Turks, who were of course enemies of all Christendom at that time, Professor Kahle has traced in Turkish records the fact that an uncle of Piri Re'is had owned a Spanish slave, captured with some Spanish ships in the western Mediterranean. This Spaniard claimed to have made several voyages with Columbus. Professor Kahle thinks it not improbable that the Turks may have taken a copy of the 1498 map from the captured ship, and that this copy was in turn copied by Piri Re'is on his world map of 1513.

One feature of the Re'is map may throw a little additional light on the still-disputed matter of Columbus's nationality. A small group of islands in the West Indies is designated as "the islands of the eleven virgins"; and the word "eleven" is given in Italian, "undiei," not in Spanish, "once."

ITEMS

New fossil remains of Peking Man, Sinanthropus Pekingensis, have been found at the Chou Kou Tien site where the original skull was discovered in 1929. The new find consists of fossilized small bones from the wrist. They are reported to be definitely human in character.

THE identification of several species of fossil fungi has been reported to the Polish Academy of Letters and Sciences by Madame Wanda Zablocka, of the Janczewski Botanical Laboratory. Fungi are not often preserved as fossils; but these were of the type known as pyrenomycetes, which form hard woody growths on the branches of trees which they infest as parasites. The species identified by Madame Zablocka date from Tertiary geological time, which ended some ten million years ago. They were found in a salt bed.

ONE hundred and ten hospitals in the United States were forced to close their doors during 1931 as a result of the depression, Homer Wickenden, general director of the United Hospital Fund in New York, has reported to the Committee on Welfare and Relief Mobilization of 1932. "If hospitals were forced to lower their medical standards, restrict their x-ray service and their laboratory work, and discharge their nurses and social workers they would probably find that the increased length of stay of the patients, particularly the free patients, would make their financial burdens all the heavier," he pointed out. "The public, not only for its own safety, but in the interest of economy owes it to the voluntary hospitals to see that medical standards are maintained and that scientific progress is promoted in spite of the hard times," he advised.

THE bob-white quail, known to winter hunters as a wild, timid bird, haunts farmyards and appears to like human society in the summer, Arthur C. Bent says in a report issued by the Smithsonian Institution. Among other curious facts about this common bird, Mr. Bent explains why they are believed sometimes to "withhold their scent" thus eluding dogs. The explanation probably is that the rapid passage through the air dissipates most of the scent from the plumage. The birds being frightened, crouch low on the ground with feathers closely pressed against the body, shutting in body odors. And, as they have not run anywhere, there is no foot scent. Under ordinary circumstances, however, the bobwhite shows a definite preference for using his feet rather than his wings. Quail do much of their traveling on foot, and they are great travelers. In some sections they are said to make seasonal migrations from one type of country to another, the journeys being made largely on foot. Mr. Bent believes that they prefer to escape their enemies by running, until too hard pressed. A bird dog will often trail a running bevy for a long distance.

THE WISTAR INSTITUTE BIBLIOGRAPHIC SERVICE

TESTIES

AUTHORS' ABSTRACTS

of all papers appearing in the journals listed below prior to publication of the articles in full. By this advance information biologists may familiarize themselves with contemporary research in a minimum of time.

Advance Abstract Sheets are issued twice a month, each sheet containing ten or more authors' abstracts. Subscription rate is \$3.00 per year.

Bibliographic Service Cards, following the Advance Abstract Sheets, also are issued twice a month. In addition to the authors' abstracts, the cards provide subject headings and complete bibliographic reference. The cards are convenient for filing and library records. Price, \$5.00 per year.

At regular intervals the authors' abstracts are assembled and published in book form with complete authors' and analytical subject indices. Price, \$5.00 per volume. Liberal discount to subscribers to the Bibliographic Service Cards.

Journal of Morphology
The Journal of Comparative Neurology
The American Journal of Anatomy
The Anatomical Record
The Journal of Experimental Zoölogy
American Anatomical Memoirs
American Journal of Physical Anthropology
Journal of Cellular and Comparative Physiology
Folia Anatomica Japonica (Tokyo, Japan)
Physiological Zoölogy (Chicago, Illinois)
Stain Technology (Geneva, New York)
Ecological Monographs (Durham, North Carolina)

The Wistar Institute of Anatomy and Biology Philadelphia, Pa., U. S. A.

Second Edition: Revised and Enlarged

THE RAT: DATA AND REFERENCE TABLES

Memoir No. 6: 458 pages. Bibliography: 2206 titles HENRY H. DONALDSON

Published by The Wistar Institute Philadelphia, Pa., U. S. A. Price, \$5.00

The Rat: A bibliography, 1924-1929.

L. E. DRAKE and W. T. HERON 1353 titles—with subject index.

Price-50 cents

Orders may be sent to

The Wistar Institute, 36th Street & Woodland Ave., Philadelphia, Penna.

Neat	A I No Gas Storage		
Novel	T No Nuisance		
Efficient	H No Danger		
H ₂ S for the Laboratory	U E Write S for Details		
Phila. Special Chemicals Co. 1833 Chestnut Street, Phila., Pa.			

The New Book by THOMAS HUNT MORGAN

Professor of Biology, California Institute of Technology; Past President of The American Association for the Advancement of Science and of The National Academy of Sciences.

THE SCIENTIFIC BASIS OF EVOLUTION

Assembling the known facts concerning evolution and the process of heredity, this book repudiates all doctrines resting on metaphysical assumptions: Emergent Evolution, Holism, Organicism, Vitalism. An important book for geneticists, experimental biologists, and workers in allied fields who are interested in scientific method from the mechanistic point of view. A Scientific Book Club Selection. 41 illus. \$3.50.

Just Published

The First Authoritative Account of

INDUSTRIAL PSYCHOLOGY By MORRIS S. VITELES

University of Pennsylvania

The first complete study of methods employed, principles involved, and results accomplished by industrial psychology. The author has had many years of experience both in the laboratory and in industry itself. 652 pages. Over 100 illus. \$5.50.

OF DEVELOPMENT

By BERNHARD DURKEN

University of Breslau

A survey of experimental embryology. The main theme of the book is the "mechanics of development," which Professor Durken discusses in relation to the whole body of biological science. 120 illus. \$4.75.

The Saga of FRIDTJOF NANSEN By JON SORENSEN

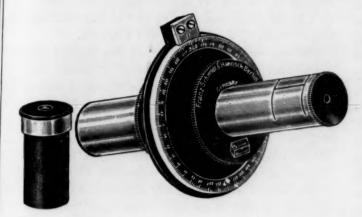
All private sources were opened for this complete biography of the great Norwegian scientist—a book of importance to geographers and oceanographers, and of great interest to all scientific men. Fully illustrated. \$4.50. Send for copies on approval.



W. W. NORTON & CO., INC. 70 Fifth Avenue, New York.

MARTENS

POLARIZATION PHOTOMETER



FOR REFLECTION AND TRANSMISSION MEASUREMENTS

» » IMPROVED OPTICS « «

REFLEXFREE IMAGE GREATER SENSITIVENESS

Write for List P25

Sole American Distributors

AKATOS, Inc.

Engineering Building

114-118 Liberty Street

New York City

CASTLE INCUBATORS

Facts That Prove Their Superior Quality

1° + Uniformity: Never more than one degree variation between top and bottom of chamber.

1/5 to 1/10° + Constancy: Never more than a fraction of a degree variation at the thermometer. This accuracy of temperature holds up to a room temperature of 95° F.

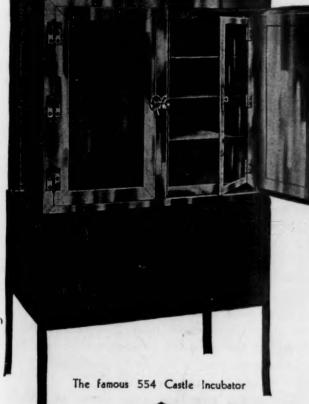
98% Usable Capacity: Practically no space in chamber is wasted by heaters or controls. Four removable shelves.

Air Circulation: Fresh circulating air is admitted thru tube that passes thru water jacket. Thus air is

Quality: Incubator is triple walled-outer jacket for air, inner for water. 20 to 24 oz. copper used. Positive electric regulator, capsule type. Heaters are nichrome wire or mica, bolted to bottom. Two outer doors are air jacketed, inner doors are glass.

Write for Incubator bulletin.

Wilmot Castle Company 1212 University Ave. Rochester, N. Y.



SCIENCE NEWS

Science Service, Washington, D. C.

THE UNITED STATES INCH

The inch has lost two millionths of its former size. Though the shrinkage in length is not legal, industry of this country at a meeting of its representatives with the American Standards Association in New York decided to use a new ratio between the American inch and the millimeter in order that the precise measuring of both England and the United States be done on the same basis. Their new definition says that the inch is exactly 25.4 millimeters long instead of 25.40005 millimeters. This is a difference of about one eighth of an inch in a mile.

Adoption of the new ratio is the second and last step necessary to put precision measuring of industry of England and the United States on the same basis, H. W. Bearce, co-chief of the Division of Weights and Measures of the U. S. Bureau of Standards, told Science Service. The first and most important step was taken by England, he said, when that country's industrial representatives decided to use 68 degrees Fahrenheit as the standard reference temperature for dimensions. Their standard to which corrections for expansion and contraction had been made was 62 degrees, while engineers in the United States used 68 degrees.

"These changes were necessary," Mr. Bearce explained, "because manufacturers of precision gage blocks are attaining an accuracy of one or two millionths of an inch per inch of length, while manufacturers of precision limit gages are regularly working to an accuracy of a few hundred thousandths of an inch. Obviously in work of this character, uncertainty or indefiniteness to the extent of the difference between the United States inch and the British inch (about one part in 363,000) could not be tolerated. The U. S. Bureau of Standards and the National Physical Laboratory at Teddington, England, will certify industrial gages on the new basis."

Mr. Bearce explained that some engineers will probably describe the changes as the setting up of a new industrial millimeter rather than the actual changing of the length of the inch. The millimeter now widely used, a unit of the metric system, is defined by the length of a platinum bar at the International Bureau of Weights and Measures near Paris. The metric system of weights and measures is standard throughout the world in other than English-speaking countries.

A TOXIC EFFECT OF DEXTRIN

A PARTIALLY digested food may be more poisonous than a non-digested one, it appears from recent experiments by Dr. Lillias D. Francis, professor of physiology at Wellesley College.

Working at Yale University, Dr. Francis found that the use of dextrin, an intermediate product in the digestion of starch, in the dietaries of her mice was followed by severe diarrhea, loss of weight and finally death. If, however, the dextrin was replaced by starch, the more complex carbohydrate from which the dextrin may be derived, the mice did not develop any abnormal symptoms and thrived. Not only that but if, after the animal was suffering with all of the typical symptoms of this "dextrin poisoning," starch was substituted for dextrin in the diet of the animal, it was cured. A return to the dextrin-containing diet at any time was always accompanied by a return of the diarrhea.

The degree of the toxicity of the dextrin seemed to be dependent upon the amount of it used; thus, if 38 per cent. dextrin was used as the source of carbohydrate in an otherwise adequate diet the mice suffered for five to eight days and then recovered. If 52 per cent. dextrin was used the animals suffered a great deal more and if 70 per cent. was used they lived only a few days. All control animals on similar diets but with concentrated starch instead of the partially digested dextrin were quite normal. About 76 animals of all ages have been tested so far.

The cause of the death, according to Dr. Francis, is not known. She has found that the caecums of the affected animals are distended by gas to almost 300 per cent. of their normal size and she has suggested that there is a possibility that a changed bacterial flora in the intestine may have been induced by the imposed dietary régime.

"It is also very interesting that young mice are more susceptible to the deleterious and lethal effects of dietary dextrin than are adult animals," says Dr. Francis. "We are investigating the condition and hope to be able to offer an explanation for it in the near future. It is particularly interesting that this seems to be the only evidence of such a toxic effect of dextrin. I have some experiments going on rats which would indicate that they are not harmed as are the mice, which makes another interesting side of the story which I hope to explain."

CRIME AND DISTURBED ENDOCRINE FUNCTION

In the American Journal of Psychiatry, Dr. Louis Berman, of New York City, widely known as the author of a sensational book on "The Glands Regulating Personality," advances the thesis that a good portion of delinquency in the young and of criminality in the adult is due to disturbed function or imbalance in function of the endocrine glands of the body, the pituitary, thyroid, adrenal, thymus and reproductive glands. He supports his views by a comparative study of 250 criminals and 280 normal persons, upon whom examinations were made of basal metabolism, blood-chemistry, radiograms of the skull and the state of function of the endocrine glands. It would seem from these examinations that not only are endocrine disturbances more frequent in the criminal class, but that even the blood-chemistry is different, the criminals showing a higher concentration of uric acid, more non-protein nitrogen, etc.

The author goes into great detail in regard to the endocrine imbalances, listing certain combinations that

are correlated with robbery and burglary, others with grand larceny, still others with petty larceny, with murder, fraud, forgery, rape, arson and assault. Diagnoses are made with seeming ease and accuracy, as illustrated in two cases in one of which the result is expressed as thymus +4, adrenals -3, gonads -2, in the other, thyroid +4, thymus +4, parathyroid -4. He describes also several cases of juvenile delinquents in which the subjects were regenerated and rescued by adequate endoerine therapy. On the basis of his theories Dr. Berman advocates the establishment of great regional endocrine clinics throughout the country for the examination and treatment of delinquent children and, in addition, preventive clinics to which all children should be taken for periodic surveys of the condition of their endocrine functions.

Even a cursory reading of the paper creates a feeling of skepticism and it is not likely that his over-confident speculations will find any more support from sober scientific research than his previous extreme views on the relations of personality to endocrine function.—W. H. HOWELL.

THE POLLINATION OF PINE FLOWERS

HYBRID pines and other trees, to grow better lumber in less time, are the goal of the Institute of Forest Genetics, with headquarters at Placerville, California. Several new tricks of botanical technique have been developed to speed the work, one of the most interesting of which is the use of a hypodermic needle for pollinating the female pine flowers, which develop into the seed-bearing cones.

Under natural conditions, pines and similar trees are wind-pollinated. Their female flowers open and receive pollen shed into the air by the male or staminate flowers, and carried by the wind in yellow clouds.

This is obviously a most unselective process. One can select a good mother for one's crop of seeds, but their fathers are wholly unknown, as chance and capricious as the wind itself.

To insure a knowledge and control of the paternity as well as the maternity of their seeds, the botanists here tie close-woven canvas bags over the twigs bearing unopened female flowers. Celluloid windows in the bags permit them to see when the flowers open. No chance wind-borne pollèn can reach these cloistered pine-flower virgins. They are as strictly under control as old-fashioned French girls awaiting their parents' pleasure in a marriage of convenience.

When they are ready to carry out the pollination, the botanists load the chosen pollen into a sterilized hypodermic syringe. The needle is plunged through the fabric of the bag, and the fertilizing yellow dust puffed in on the flowers by means of a small rubber bulb. Then the puncture hole is sealed over with a bit of adhesive tape and the flowers are still left in the bag until they have set their seed and there is no chance of any contaminating foreign pollen getting in.

It has been learned that pine pollen will keep for a year or more, so that pollens can be stored from one

season to the next, or brought from as far away as India to use in making hybrids with western American pines.

ITEMS

MERCURY and iodine disinfectants were the most effective for killing fungus growths similar to the one suspected of causing athlete's foot, Dr. Chester W. Emmons, of the College of Physicians and Surgeons, Columbia University, found from studies which he reported to the American Public Health Association. Dr. Emmons reported the action of a number of other disinfectants, among them some copper and sulphur ones, which he found ineffective in killing the funguses he studied.

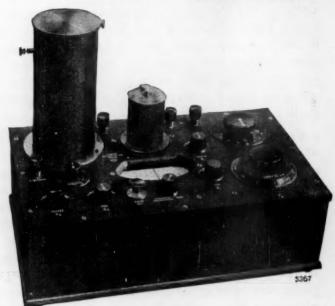
FEEDING cows on irradiated yeast or other good source of vitamin D increases the vitamin D content of the cows' milk fifteen to thirty times, Drs. J. G. Hardenbergh and L. T. Wilson, of the Walker-Gordon Laboratory Company, Inc., at Plainsboro, N. J., reported to the American Public Health Association, Milk ordinarily contains only small amounts of vitamin D, but when this is increased by supplementing the cows' ration with a source of vitamin D, the milk acquires the ricketspreventing quality of this vitamin. The amount of vitamin D that must be fed the cows to give their milk rickets-preventing potency has been worked out and found not only not harmful but instead rather beneficial to the animals. The production of such a special milk must be under adequate official supervision to insure reliability.

Dr. Louis Schwartz, of the U.S. Public Health Service, reported to members of the American Public Health Association that personal cleanliness is an important means of preventing inflammations of the skin acquired by industrial workers in the course of their work. Other important preventive measures are the substitution of harmless substances for irritants and proper ventilation to allay dust and fumes. About half of all compensation claims are for cases of the condition known as dermatitis, which covers skin inflammations and diseases. About 100,000 cases of occupational dermatitis occur throughout the United States in one year. The majority of occupational skin diseases in the United States are caused by acids, alkalies, caustics, oils, greases, solvents and plants.

Creation of extreme low temperatures to within 1.5 degrees Centigrade of absolute zero where all heat disappears is to be undertaken this winter in a series of experiments that may lead California Institute of Technology physicists to the discovery of fundamental laws governing the internal structure of solid matter. Dr. Alexander Goetz, associate professor of physics, visited Europe this summer where he studied the technique of producing low temperatures. He anticipates that this frigid method attack will allow the study of the crystal structure of metals in their least disturbed state. This is considered essential to discovering fundamental laws, as the crystal structure is more or less disturbed at increasingly higher temperatures.

Cambridge pH Meter

Electrometer Tube Pattern



36x22x30 CM.

Send for list Supplement 108

THE value of the glass electrode as a means of measuring pH has been known and appreciated for some time. Its advantages include freedom from poisoning and that it is not affected by powerful oxidizing and reducing agents. These advantages, however, have been somewhat offset by the practical difficulties of measurement.

The Cambridge Electrometer Tube pH Meter illustrated, provides a direct reading instrument calibrated in pH units which requires no technical knowledge, no calculations or reference tables and is as simple to operate as an ordinary Potentiometer. The instrument may also be used with any electrode system over a wide range in temperature, and has a range of 14 pH units with readings possible to .01 pH.

CAMBRIDGE INSTRUMENT CO INC

Pioneer Manufacturers of Precision Instruments
3732 Grand Central Terminal, New York

LIVING CULTURES

AMOEBA PROTEUS
PARAMECIUM MICROMULTINUCLEATUM
EUGLENA SPIROGYRA

STENTOR VORTICELLA SPIROSTOMUM AMBIGUUM

Class of 50, \$2.00

Class of 12, \$1.25

HYDRA FUSCA

Class of 50, \$2.50 Class of 25, \$1.50 PLANARIA

One dozen, \$1.00 One hundred, \$7.50

SLIDE PREPARATIONS BOTANY AND ZOOLOGY PRESERVED SPECIMENS BOTANY AND ZOOLOGY

The quality of our material is attested to by many educational institutions.

Prompt Service

THE PENNSYLVANIA BIOLOGICAL SUPPLY HOUSE
412 HOWARD AVENUE ALTOONA, PENNSYLVANIA

LATEST BOOKS McGRAW-HILL

Braun-Blanquet—Plant Sociology The Study of Plant Communities

By Dr. J. Braun-Blanquet, Director, Station Internationale de Géobotanique Méditerranéenne et Alpine, Montpellier, France. Translated, Revised, and Edited by George D. Fuller, Associate Professor of Ecology, The University of Chicago, and Henry S. Conrad, Professor of Botany, Grinnell College. McGraw-Hill Publications in the Agricultural and Botanical Sciences. 439 pages, 6 x 9, illustrated. \$4.50

This authorized translation of Dr. Braun-Blanquet's distinguished work, Pflanzensoziologie, presents a unified and comprehensive survey of the scope, aims and limits of plant sociology. The book is essentially an ecological study of plant communities. It not only analyzes the climatic, chemical and physical factors which control vegetation, but also evaluates the vegetation itself in a quantitative manner. The original German edition made available for the first time many important European studies, to which the translators have now added the more recent findings of leading ecologists, both in this country and abroad.

Clark-Applied X-Rays

By George L. Clark, Professor of Chemistry, University of Illinois. International Series in Physics. Second Edition. 461 pages, 6 x 9, illustrated. \$5.00

The second edition of this standard text covers the science of x-rays as it exists today. The latest industrial developments and applications are clearly illustrated by actual, representative examples, and the physical, chemical and medical branches of the subject are presented in the light of recent developments in those fields. New, important sections have been added, dealing with the scientific basis for metal radiography, interpretation of x-ray patterns, crystal chemistry, commercial alloys, the scientific and practical aspects of metallurgy, and the latest information on colloidal substances.

Smith—The Elements of Physics

By Alpheus W. Smith, Professor of Physics, The Ohio State University. Third Edition. 778 pages, 6 x 9, illustrated. \$3.75

This popular text has been completely rewritten, and now constitutes a survey which, while covering the field of classical physics, at the same time provides a wholly adequate treatment of modern developments. Stressing the application of the fundamental principles of physics to everyday life, this edition presents an entirely new list of problems. Greater clarity has been achieved by a reorganization and subdivision of chapters. In dealing with the field of modern physics, much space is now devoted to such subjects as the quantum theory of radiation, the electron theory of matter, the flow of liquids and the kinetic theory of gases.

Emmons, Thiel, Stauffer and Allison-Geology

By William H. Emmons, Professor of Geology, University of Minnesota; George A. Thiel, Associate Professor of Geology, University of Minnesota; Clinton R. Stauffer, Professor of Geology, University of Minnesota; and Ira S. Allison, Professor of Geology, State Agricultural College, Corvallis, Oregon. 514 pages, 6 x 9, illustrated.

The chief aim of this text is to give the student a comprehensive knowledge of the materials of the earth, the processes that operate at the earth's surface, and those which have operated in the past to form the earth. Much thought has been given to the order of presentation: the earlier chapters discuss the processes more commonly observed in operation; the later chapters deal with those processes less frequently encounted. One of the notable features of the book is the exceptionally large number of fresh, interesting illustrations. The text covers such subjects as weathering, glaciers, diastrophism, vulcanism, metamorphism, ore deposits and historical geology.

Send for copies on approval

McGRAW-HILL BOOK COMPANY, Inc.

McGraw-Hill Building

330 West 42nd Street

New York

SCIENCE NEWS

Science Service, Washington, D. C.

PUBLIC HEALTH

OPTIMISM was the keynote of the gathering of doctors and health experts at the American Public Health Association meeting at Washington last week. The health of the country has never been better.

Membership in the organization is at its peak. The number of life members has doubled, in spite of the economic depression. Enrolment in the health education institute showed more than double the expected number. Some students came all the way from Texas especially to attend this new feature of the annual meeting.

Visions of the future in which clean, healthy air will be an accomplished fact in cities, as pure water and clean milk are now, were held out.

"Sickness and death rates are either the lowest in the history of the country or very close to it," declared Dr. Louis I. Dublin, of New York City, in his address as president of the association at its first general session. "There is no evidence as yet that the depression has adversely affected the physical resistance of the people. Infant mortality, deaths from the communicable diseases of children, tuberculosis and pneumonia, all of which we have in the past, either rightfully or wrongfully, associated with the level of the standard of living, have continued to decline this year."

However, Dr. Dublin pointed out that there are no records that show the effect of the depression on the mental health of the people, and he expressed the fear that this must be "anything but good." He decried the fact that health departments all over the country had suffered budget cuts. "No community even at present is so poor that it can not afford to safeguard the life of its citizens," he said. "I hate to think what it would mean in cold dollars and cents if we were suddenly confronted with epidemics of typhoid fever, of smallpox or of diphtheria." From two to three dollars per capita would give most places excellent public health service. Clean air with its full value of health-giving ultra-violet light must be furnished to all the people just as clean milk and water are now available, is the opinion of Dr. Fred O. Tonney, of the Chicago Health Department. Air pollution is not alone a matter of economic and esthetic concern. It is an acute health problem. Smoke and soot in the air screen out the ultra-violet rays which prevent rickets and are also necessary for the health of expectant mothers and their unborn babies. He suggested that supplying clean air might become a function of govern-Underground conduits, like aqueducts and sewers, may be used as outlets for objectionable fumes from combustions and industrial processes in the cities of the future. Natural gas might solve the problem, as the combustion products of gas heating do not shut out the sunshine. Or hydroelectric power might be used to furnish clean heat. A practical step toward cleaner air for cities has been taken in Kansas City, where central steam heating plants burning coal and oil are replacing

small units in congested areas. This has already had a noticeable effect on air conditions.

The health forces of the nation are engaged in mopping up operations against the guerrillas of the disease battle. These stragglers of the anti-health forces are the carriers of typhoid, diphtheria and other infectious diseases, who innocently spread ills among the population while not being sick themselves.

A special session of the association was devoted to consideration of these carriers. This indicates, in the opinion of Dr. Haven Emerson, of Columbia University, who presided at the special session, that public health technic has reached a high level of refinement. There are two distinct levels in the management of disease control. On the first level come mass operations, such as water purification and milk pasteurization. Then when the amount of infectious disease level has been reduced markedly by these means, the main spreaders of disease are found in the carriers. When man begins to take an intelligent interest in the carriers, it means he is closing in on the diseases in his struggle to conquer them.

Studies showing that healthy carriers of whooping cough exist were reported by Dr. Travis P. Burroughs and Dr. Edmund Kline, of the Cattaraugus County, New York, Health Department. These carriers, however, are probably of little importance in the spread of the disease. Healthy carriers of infantile paralysis may be as important in the spread of this disease as diphtheria carriers are in the spread of diphtheria, Dr. Lloyd Aycock, of Harvard University School of Public Health, observed. Methods of detecting carriers of tuberculosis, typhoid fever and other diseases were discussed at the meeting.

Noise has been shown to have a harmful effect on the recuperative value of sleep. Conversely, it increases mental effort and so depletes the vitality so necessary in modern life. The importance of recognizing the effect of noise on the health of people was emphasized by C. R. Cox, sanitarian of the New York State Health Department, who is chairman of the committee on noise which presented a progress report to the meeting. Studies of the committee both in America and abroad showed that the most satisfactory results may be secured through the creation of noise abatement commissions. These must be supplied with sufficient funds to employ an administrative staff.

The best nourished children in all Europe are to be found in Russia, in the opinion of a group of physicians who have visited the various countries, studying health conditions. Dr. John Sundwall, professor of public health and hygiene at the University of Michigan, attributes the splendid health condition which he observed in Russian children to health-promoting activities of the government. He stated that he knew of no country in which the government has more interest in watching the health of the individual right through his life. More important than the economic and industrial undertakings of the five-year plan is what Dr. Sundwall termed the

THE CENTURY EARTH SCIENCE SERIES

EDITED BY

KIRTLEY F. MATHER, Ph.D.

HARVARD UNIVERSITY

EARTH HISTORY

Ву

LUTHER C. SNIDER, Ph.D. Consulting Geologist

A Rare Volume

"A rare volume which takes the reader out of the closely pressing details and complexities of modern life and gives him the opportunity to gain an understanding of the present and an appraisal of the future of the Earth and its inhabitants."—W. T. Thomas, Jr., Princeton University.

A Step in Advance

"The history treatment is excellent. The book is unique in its treatment and I think it is a distinct step in advance."—W. H. Haas, Northwestern University.

Distinctive—Refreshing

"This volume is the most distinctive textbook in the field of general geology which has appeared in decades. Its unique organization is distinctly refreshing." — George B. Cressey, Syracuse University.

Will Arouse and Hold Interest

"While the treatment of the subject is rather novel, I think that it is one which will arouse and hold the interest of the student in the science of geology to a much greater extent than the usual manner in which the subject is approached in college textbooks."—Charles R. Fettke, Carnegie Institute of Technology.

Other Comments

"I am enthusiastic over the possibilities of Earth History."—Carey Croneis, University of Chicago.

"I consider the book one of the notable contributions to geologic literature."—Thomas M. Hills, Vassar College.

Royal 8vo, 675 pages. Illustrated.

THE CENTURY CO.

353 Fourth Avenue

New York, N. Y.

ust as important as technical facility— the ability to get along with people

THIS IS THE SUBJECT OF THE

HUMAN ENGINEERING

Series

A group of books cradled in a famous technical institution—the Massachusetts Institute of Technology, sponsor of a formal course in Humanics

Especially designed to supplement technical knowledge with understanding of Human Nature

Foundations for Human Engineering Elements of Human Engineering

By CHARLES R. GOW

These two books explain the qualities essential to success in life, particularly in human and professional relationships. They are full of sound advice, inspiring stories, pointed anecdotes, axioms and quotations from famous people—a rich source of human wisdom.

-and now

Problems in Human Engineering

By F. ALEXANDER MAGOUN and His Students

A case book built around fifty typical difficulties and emergencies that professional men have actually had to face, this concluding volume is an effective means of bringing young people up against the actual problems of business life without penalizing them for wrong decisions. Included are solutions worked out by students in the Humanics class, accenting the controversial nature of the work.

These books may be used as class texts, as food for discussion groups, as a source of inspiration for leaders of young people. Large industrial corporations distribute them to their employees. Educational institutions find them useful in a multitude of ways. You, too, can put them to work.

Foundations, \$1.60. Elements, \$1.60. Problems, \$2.60.

THE MACMILLAN CO., 60 Fifth Avenue New York City

"spiritual side" of the plan. This takes in such factors as health, education, hospitals, medical service and sickness insurance. In the cities, such as Karkov, Leningrad and Moscow, each industry has its health centers, while the public schools have their own medical service. The future belongs to the country that produces the greatest number of children and sees that they grow up normal and free from physical defects. Russia is putting that maxim into practice, and Dr. Sundwall foresees a great future for the country. Even the overcrowding, which exists in the cities at present, shows growth and as such is an indication of the health of the country.

The strain of typhoid fever germs from which most anti-typhoid vaccines are now made may no longer be efficient in giving protection against the disease. Studies showing this were reported by Dr. Francis B. Grinnell, of Harvard University. The vaccines like those which were used so successfully to protect American soldiers during the war, are made from what is known as the Rawlins strain of typhoid germs. The original germs of this strain, the ancestors of the ones that make the typhoid vaccines, were isolated from a soldier who died in the South African war. Bacteriologists have found recently that germs are not very stable. They may change their form and characteristics as they grow older, and with these changes there is sometimes a change in virulence. The Rawlins strain of typhoid germs has shown some of these changes, and investigations with mice showed that the Rawlins strain was much inferior as a protective agent to some of the other strains with which they are compared. Dr. Grinnell urged substitution of the newer, more virulent strains in the preparation of antityphoid vaccines.

Strange changes in hemolytic streptococci, from cases of erysipelas and scarlet fever, were described by Dr. Sophie Spicer, of the New York City Health Department. Dr. Spicer is now trying to produce toxins from the original and from the new strains of streptococci, and is making other studies, to see what difference these changes make in the effect of the germs on the body, both as regards producing disease and giving protection against it.

THE NOVEMBER METEORS

NINE groups of observing parties, including astronomers at five observatories, will join in watching for shooting stars on three nights in the middle of November.

Scattered at points from Philadelphia to Virginia, these observers have been organized by Dr. Charles P. Olivier, director of the Flower Observatory of the University of Pennsylvania, and president of the American Meteor Society. The Naval Observatory and the Georgetown University Observatory at Washington; the Hood College Observatory, at Frederick, Maryland; the observatory of the Maryland Academy of Sciences at Baltimore, as well as the Flower Observatory, are in the "hook-up."

In this way, it is hoped to get an accurate record of the numbers of meteors that appear in the Leonid shower of shooting stars. Every year some of these meteors appear, but astronomers think it likely that this year may see a display that has not been equaled since 1866. The night of November 15 and early morning of November 16, it is supposed, will bring the greatest numbers, but the observers will be on the watch during the preceding and following nights as well.

Dr. Olivier warns the public against expecting the meteor shower with as much confidence as the coming of an eclipse. Meteors are much more uncertain than eclipses. Though there were fine displays at approximately 33-year intervals, in 1799, 1833 and 1866, another was expected for 1899, but failed to appear. The reason was that the swarm of meteors which might have encountered the earth at that time had passed close to the planet Jupiter, and had been pulled aside by Jupiter sufficiently to miss our planet.

Mathematical studies made recently by members of the computing section of the British Astronomical Association, however, indicate that the swarm has been switched back. Tempel's comet, last seen at the time of the 1866 shower, is due for a close approach to the earth this year, and its orbit coincides closely with that of the meteors. Probably, suggests Dr. Olivier, the meteors and the comet are "brother and sister," both parts of a still larger affair that broke up ages ago.

In November, 1833, the whole sky was covered with meteors, hundreds being visible at once. All seemed to emerge from a point in the constellation of Leo, the lion, from whence comes their name, "Leonids." Actually, however, the meteors are moving in parallel paths. When they encounter the atmosphere of the earth, the friction ignites them, and they disappear in a blaze of light which is seen as a shooting star. Being parallel, the paths seem to join at a point in the direction from which they come, just as the rails of a track seem to join in the distance.

In November, 1930, a much better shower was seen than for many years, and last year it was still better. This would indicate, it is supposed, that the earth was then entering the outer part of the main meteor swarm. These meteors move around the sun in a gigantic elliptical orbit 1,900,000,000 miles long and take a little over 33 years to make a circuit. There are a few scattered meteors all around the ellipse, but the main swarm is concentrated like the gem in a ring. It is an encounter with this "gem" that causes a great shower.

NEW MATERIALS IN STEEL MAKING

CHEAPER substitutes for ferromanganese, necessary for removing oxygen in the final step in making steels, have been developed through several years of cooperative research at the Carnegie Institute of Technology at Pittsburgh.

In case of war the steel industry could run on a fifth to a third of its present imported ferromanganese which must now be added at the rate of about fourteen pounds to every ton of steel produced. This important step toward America's military self-sufficiency is a byproduct of the research conducted by Dr. C. H. Herty,

Just Published

Flora of the Prairies and Plains of Central North America

BY PER AXEL RYDBERG, PH.D.

This cloth-bound volume contains 969 pages, with 601 text-figures. It includes descriptions of 177 families, 1066 genera, and 3,988 species, keys to all groups, with glossary, list of author abbreviations and index. It aims to describe all of the native and naturalized species of ferns, fern-allies and seed-plants of Kansas, Nebraska, Iowa, Minnesota, South Dakota, and of parts of Illinois, Wisconsin, Missouri, Oklahoma, Colorado, Wyoming, Montana, Manitoba, and Saskatchewan.

and Price \$5.50, postpaid

Address The New York Botanical Garden Bronx Park (Fordham Station) New York, N. Y.

THE WISTAR INSTITUTE BIBLIOGRAPHIC SERVICE

ISSUES

AUTHORS' ABSTRACTS

of all papers appearing in the journals listed below prior to publication of the articles in full. By this advance information biologists may familiarize themselves with contemporary research in a minimum of time.

Advance Abstract Sheets are issued twice a month, each sheet containing ten or more authors' abstracts. Subscription rate is \$3.00 per year.

Bibliographic Service Cards, following the Advance Abstract Sheets, also are issued twice a month. In addition to the authors' abstracts, the cards provide subject headings and complete bibliographic reference. The cards are convenient for filing and library records. Price, \$5.00 per year.

At regular intervals the authors' abstracts are assembled and published in book form with complete authors' and analytical subject indices. Price, \$5.00 per volume. Liberal discount to subscribers to the Bibliographic Service Cards.

JOURNAL OF MORPHOLOGY
THE JOURNAL OF COMPARATIVE NEUROLOGY
THE AMERICAN JOURNAL OF ANATOMY
THE JOURNAL OF EXPERIMENTAL ZOÖLOGY
THE ANATOMICAL RECORD
AMERICAN ANATOMICAL MEMOIRS
AMERICAN JOURNAL OF PHYSICAL ANTHROPOLOGY
JOURNAL OF CELLULAR AND COMPARATIVE PHYSIOLOGY
FOLIA ANATOMICA JAPONICA (Tokyo, Japan)
PHYSIOLOGICAL ZOÖLOGY (Chicago, Illinois)
STAIN TECHNOLOGY (Geneva, New York)
ECOLOGICAL MONOGRAPHS (Durham, North Carolina)

The Wistar Institute of Anatomy and Biology

The Printing of SCIENTIFIC PUBLICATIONS

The Science Press Printing Company has been established and equipped for printing scientific literature in the best way, with compositors, pressmen and proof-readers trained for technical work. It is a business corporation but it has been founded to provide facilities essential for the advancement of science.

The corporation owns its building at Lancaster, Pennsylvania. It has the best obtainable presses, composing machinery and binding equipment. What is more important, it has the most competent pressmen and compositors in a city which, since "Science" was first printed there in 1894, has become a center for fine scientific printing. The costs are much less than in the large cities.

The press prints "The Scientific Monthly," "Science," "School and Society," "The American Naturalist" and some twenty other scientific journals and publications. The typography and presswork of these journals will bear comparison with any weekly or monthly publication, although, for example, "Science" must be printed mostly in one day in an edition of over 14,000. "The Biographical Directory of American Men of Science" and "The Biographical Directory of Leaders in Education" are examples of the work of the press. It can, to special advantage, print scientific books, monographs and doctorate dissertations.

Samples of work and estimates of costs will be supplied on application.

The Science Press Printing Company Lancaster, Pa. Jr., and recently reported to the Carnegie Institute's Metallurgical Advisory Board.

An alloy of iron with manganese, known as ferromanganese, is conventionally used to deoxidize the steel. The manganese is fond of oxygen, takes it away from the iron and abducts it into the slag. Dr. Herty first made a twin combination of manganese and silicon that did the work of ferromanganese cheaper and better. For over a year these manganese-silicon alloys have been tested commercially with success in open-hearth steel making at a few large steel plants.

Now Dr. Herty is ready to present to the steel industry a triplet deexidizer, an alloy of manganese, silicon and aluminum. Aluminum has an even greater avidity for oxygen than silicon or manganese. This triplet deoxidizing alloy can be made from American iron ore that runs from 5 to 35 per cent. manganese, sand that contains silicon and bauxite which is the ore of aluminum. All these are American products, the supply of which would not be interrupted by a war. The new manganese-silicon-aluminum alloy will be given its first commercial test within a month. So far its use has been limited to test runs in the laboratory.

In making steel from pig iron, oxygen is first introduced into the molten mass to remove impurities that will combine with oxygen and pass off in the slag. Then the oxygen must itself be removed and that is the function of ferromanganese and Dr. Herty's new twin and triplet deoxidizers.

The largest American supplies of manganese-carrying iron ores are in the Cuyuna range of Minnesota. If the highest manganese contents of these ores are held as war reserves and not wasted in making ordinary pig iron, Dr. Herty explained, they will be a valuable mineral resource for the future.

ITEMS

SINANTHROPUS, the prehistoric man of Peking, may have existed on earth at a later date than either Pithecanthropus, the Java Ape Man, or Eoanthropus, the Dawn Man of Britain, yet he was more nearly an ancestor of our own than were either of these, his elders. So declares Professor G. Elliot Smith, noted British anatomist, in the annual report of the Smithsonian Institution. "His characters are more generalized, some of them distinctly reminiscent of man's simian ancestry and others strangely foreshadowing the qualities hitherto regarded as distinctive of Homo sapiens. In other words, Sinanthropus enables us to picture the qualities of the original members of the human family by revealing a type which, though human, was curiously ape-like, and obviously close to the main line of descent of modern man."

THE ranks of evolutionary "missing links" have lost another member. This time it is a fly, a curious insect from the high-lying lake region of southwestern Argentina, that fills a gap between the bot-flies that bother cattle and a group of tiny flies that parasitize other insects. The common house-fly is only a distant relative.

The find was made by Raymond C. Shannon, a Smithsonian entomologist, but its significance was not realized until the specimen reached the U. S. National Museum. Here it was examined by Charles H. T. Townsend and Dr. J. M. Aldrich, curator of insects. The new fly is like a bot-fly, except that it has bristles on its body, while the bot-fly is smooth. It represents, possibly, a "surviving ancestor."

A NEW river, the Rio Brown, will appear on the future maps of South America, as a result of explorations by the Ulrich Expedition. Otto W. Ulrich, leader of the expedition, named it in honor of Dr. William Moseley Brown, of Ballston, Virginia, who, with several other sponsors, has made the expedition possible. The Rio Brown rises in the deep interior of Brazil, and flows westward into the Araguaya, which eventually reaches the sea through the great estuary of the Para river. In its upper course, the newly discovered river approaches the headwaters of the Rio Xingu, where the lost explorer Fawcett was last heard of.

Mosquitoes, which play an important rôle in the transmission of malaria and yellow fever, may also carry tularemia or rabbit fever, Cornelius B. Philip, Gordon E. Davis and R. R. Parker, of the U. S. Public Health Service, have found in studies made at the Rocky Mountain spotted fever laboratory. The part played by the mosquito in carrying tularemia is purely mechanical. If a mosquito is interrupted while feeding on an infected animal, and bites soon after, he can pass the infection along to his next victim. The disease may also be acquired when infected mosquitoes are crushed on the skin, with or without subsequent rubbing, and when mosquito excrement is deposited on the skin.

EXAMPLES of what might be called "prophetic evolution," wherein certain gland secretions are present in animals that have no known use for them, are pointed out in Nature, by Dr. David Landsborough Thomson, of McGill University. Dr. Thomson calls attention to the fact that adrenalin is present in members of the earthworm family, though if it has a function in these animals that function has never been discovered. Another case in point is the gland secretion that causes the production of milk in mammals and "pigeon milk" in the crops of pigeons—different substances, produced by different organs, yet provoked by the same stimulant. He cites several other examples.

Possibly the original ancestor of all the later sabertooth tigers, certainly the earliest cat so far found, is the distinction claimed by one of the fossil skulls brought back to Princeton University from the Big Badlands of South Dakota by Professor Glenn L. Jepsen, leader of the Scott Fund Expedition. The fossil was included among hundreds of others dug up in the Big Badlands during the past summer. It was recognized then as a saber-tooth tiger, but its unique position in the feline family tree was not then determined. Now it has been found to be a new genus, ancestral to two separate lines of saber-tooth tigers from which no connecting link has hitherto been known.

A textbook that meets an insistent demand

ELECTRICITY AND MAGNETISM

By NORMAN E. GILBERT

Professor of Physics, Dartmouth College

Designed to give the non-technical student information of general value and to lay a broad foundation for further work in either electrical engineering or mathematical investigation.

Suitable for a year course following the course in general physics in the liberal arts college or for the first course in electricity in the technical school.

NOT a work in electrical engineering, not a treatise on mathematical theory, nor yet a cyclopedia on electricity and magnetism, this text is an outline and guide, covering fundamental principles and using as illustrations applications to engineering and to appliances in common use

♦ OUTSTANDING CHARACTERISTICS ◆

Its treatment of foundations is full and clear. Each new subject is approached from the solid foundation of facts already mastered.

Its mathematics requires no knowledge beyond elementary calculus. A student taking calculus parallel with this course will be able to understand it.

It treats modern theories at considerable length, without entering too far upon controversial matters.

It contains an abundance of pertinent, modern illustrative material, much of which is drawn from engineering practice.

Its carefully prepared problems are sufficient in number to allow choice from year to year. They offer all degrees of complexity.

It is completely equipped with diagrams which are unusually clear and instructive.

This fine new textbook will be published November 29.

If you plan to teach a course in the subject next semester let us tell you more about it.

◆ CONTENTS ◆

Chapter

I. Electricity and the Electrostatic Field

II. Magnetism, Magnets, and the Magnetic Field

III. Potential

IV. Capacity

V. Electrical Images

VI. Atmospheric Electricity

VII. Terrestrial Magnetism

VIII. The Electric Circuit

IX. Measurement of Current

X. Resistance and Its Measurement

XI. Measurement of Potential XII. Electrolytic Conduction

and Batteries
XIII. Current and Magnetic
Field

XIV. The Ballistic Galvanometer

XV. Iron and the Magnetic Circuit

XVI. Direct-Current Dynamo Machines

XVII. Current in Inductive Circuits

XVIII. Measurement of Inductance and Capacity

XIX. Units and Dimensions

XX. Alternating-Current Meters

XXI. Alternating-Current Networks

XXII. Alternators—Generators and Motors

XXIII. Transformers

XXIV. Rectification of Alternating Current

XXV. Transmission and Distribution of Power

XXVI. Conduction in Gases

XXVII. Communication by Wire

XXVIII. Electromagnetic Waves

XXIX. Thermionic Electron Tubes

XXX. Thermo-Electricity

XXXI. Radioactivity and the Structure of Matter

XXXII. Electrons in Magnetic and Electric Fields.

60 Fifth Ave. THE MACMILLAN COMPANY New York City

SCIENCE NEWS

Science Service, Washington, D. C.

MEETING OF SOVIET CHEMISTS

Two thousand chemists attended the sixth Mendeléeff Congress which opened at Kharkov, on October 25, to discuss chemical problems arising out of the second five-year-plan. The Mendeléeff Congress is held every three or four years in honor of the Russian chemist who devised the periodic table of elements.

Leading European investigators who were in attendance included: Dr. R. E. Liezegang, of Frankfurt, an authority on colloids; Dr. Erich Pitch, German specialist in catalysis; Professor Kurt Hess and Dr. C. Neuberg, biochemists, of Berlin; Dr. A. Windhaus, director of the general chemistry laboratory in the University of Göttingen; Professor Jean Perrin, of Paris, and others.

During the meetings, which continued until November 2, Professor Hess read a paper on the latest achievements in the field of high molecular compounds, particularly the living cell. Dr. Pitch reported on the structure of catalysing agents.

About 500 reports were made to the congress. The main reports by Soviet investigators were "Socialist Construction and Chemistry," by Professor Zatonsky; "The Second Five-Year-Plan and Planning of Chemical Scientific Research Work," by Dr. Pyatakov; "New Principles of Research and Utilization of Mineral Raw Material," by A. E. Fersman; "Theory of Adsorption," by A. N. Frumkin; "Modern Theory of Chemical Kinetics," by N. N. Semenov; "Chemistry of Metallurgy," by E. I. Orlov, and "Chemistry in U. S. S. R. and the Harvest Problem," by K. N. Sokolovsky.

Other contributions included an account of the application of wave mechanics to chemistry by Tamm and J. Frenkel. G. M. Krjijanowsky spoke on the general electro-chemical problems connected with the chemical and electrical industry; J. K. Sirkin on the electrostatic theory of valence; Y. A. Kazurnovsky on the structure of complex compounds; B. Roginsky on theories of catalysis, and S. E. Stehepkin on the advances made by Soviet industry for the construction of chemical equipment.

An exhibition portraying the progress in chemistry in the U. S. S. R. by means of specimens of finished products and raw materials, models and diagrams, was open during the period of the congress. Excursions took place to Dneprostroy, the new hydroelectric station, to the Kharkov tractor plant and to various chemical works in the Ukraine.

The organizing committee of the congress included Professor Zatonsky, who has taken an active part in government work in the Ukraine; Professors A. Bach and A. N. Frumkin, of the Karpov Institute; Professor Buroff, vice-president, and A. Segal, member of the organization committee; N. I. Bucharin, head of the department of heavy industry; H. A. Semashko, former commissar for public health, and many others.

POWER OF COSMIC RAYS AT HIGH ALTITUDES

FIVE miles up in the air cosmic rays are many times more plentiful than they are on the surface of the earth, but they are also much less powerful and less effective than those at ground level.

Thus may be summarized research into the character of the puzzling cosmic radiation conducted by Dr. L. M. Mott-Smith, of the Rice Institute, Texas, and the U. S. Air Corps at Wright Field, at Dayton, Ohio. Data were collected by Captain A. W. Stevens, prominent because of his achievements in long-range photography; Captain R. C. Moffatt and Lieutenants J. F. Phillips and C. D. McAllister. They used an electroscope designed especially for airplane observations by Dr. Mott-Smith and Dr. L. G. Howell.

"We find that the intensity of cosmic rays at 25,000 feet is about 21 times that at sea-level and is still increasing rapidly," Dr. Mott-Smith told Science Service. "Another interesting thing is that at 25,000 feet as small an amount as one inch of lead reduces the intensity by forty per cent., a surprisingly large amount."

An inch thickness of lead is an ineffective barrier in the path of cosmic rays on the surface of the earth. Though this much lead will stop practically all x-rays and other forms of radiation, a quantity sufficient to block cosmic rays must be measured in feet.

In this study measurements of cosmic rays were made at elevations of 5,000, 10,000, 15,000, 20,000 and 25,000 feet, each measurement consisting of an average of ten individual readings.

THE AGE OF THE SUN

THE age of the sun can not be much more than 7.55 million million years, according to a statement made by Dr. Ludwik Silberstein, research physicist of the Eastman Laboratories, in *Scientia*.

Dr. Silberstein bases his conclusions on a mathematical study of astronomical researches made in part by other investigators. The luminosity of a star is proportionate to the cube of its mass. That is to say, a star twice as big as our sun gives off not merely twice as much radiation, but eight times as much. The older a star grows, the smaller it gets, because it is all the time converting its matter into energy and radiating the energy away. But the smaller it gets, the more slowly it shines itself away, by that same rule of the cube. When the sun shall at last have dwindled to one half its present mass, it will be radiating only one eighth as much energy.

The mass radiated away by the sun at present is 4,200,000 tons per second; the sun's mass in tons is expressed by a 2 followed by 27 naughts, Dr. Silberstein says. The application of a suitable mathematical formula to these two figures gives 7.55 million million years as the sun's age.

"If we know the present mass of a star," Dr. Silberstein continues, "the equation enables us to predict what

What is the best method of analyzing population statistics?

How can the effect of the death rate on population be measured most accurately? Do only a minority of deaths in the Western World bear a direct relation to births? Can a reduction of mortality offset a reduction of fertility? These are some of the questions discussed in this important new monograph—

Just Published

Fertility and Reproduction

Methods of Measuring the Balance of Births and Deaths By ROBERT R. KUCZYNSKI \$1.85

The book is intended to serve as a reliable guide on the methods of measuring fertility and reproduction. The application of these methods, even the more refined, does not presume any knowledge of higher mathematics.

DR. WARREN S. THOMPSON, of the Scripps Foundation for Research in Population Problems, says:

"I believe that this study will assist materially in furthering the more careful evaluation of fertility in different populations. Its chief virtue is that it sets forth in fairly simple terms a method of measuring fertility which shows its trend much more clearly and accurately than those ordinarily in use. It will prove of real help to those of us who are interested in demography but are unable to follow the more technical explanation of this method hitherto available." DR. CONSTANTINE E. McGUIRE says:

"This compact volume is an implement of enduring value to those who have occasion to utilize, in their studies of population, the statistical apparatus available for the measurement of fertility and reproduc-It will prove, I feel certain, an indispensable auxiliary. . . . The work of a generation of concentration on demographic movements and their appraisal and predictability has been brought together in this monograph."

Another FALCON PRESS Book

The Relativity Theory Simplified

And the Formative Period of Its Inventor

By MAX TALMEY, M.D. the boyhood friend of Professor Einstein With an Introduction by DEAN GEORGE B. PEGRAM of Columbia University

\$1.50

DEAN PEGRAM in his Introduction says:

"But what is of still more importance to the reader, the author writes as a teacher gifted in logical but simple exposition. He leads the reader through the subjects by those paths, some of his own making, that he has himself found straightest and easiest. While this book is for laymen to read and understand, it will be none the less useful to students of physics and to teachers of the subject."



FALCON PRESS SPECIAL ORDER BLANK

FALCON PRESS, INC. 1451 Broadway, New York, N. Y.

You may send me the books checked below:

Kuczynski's FERTILITY AND REPRODUCTION, \$1.85 Talmey's RELATIVITY THEORY SIMPLIFIED, \$1.50

I will honor your invoice promptly upon receipt of the books.

Signed

(S. 11-11-32)

its mass will be at any future time and, reaching back into the past, to tell how much time has elapsed since the star had a mass so or so many times greater than now. Thus, for example, if we ask what time has elapsed since our sun had twice its present mass (if such ever was the case), the answer is 5.66 million million years. Similarly, for the time since the sun had 4 times and 10 times its present mass (again if this was ever the case) we find 7.08 and 7.47 million million years, respectively.

We see, incidentally, that these figures differ less and less from each other and approach very rapidly indeed the original time-coefficient, vis., 7.55 million million years, and the remarkable thing is that even if we asked about a hundredfold, a thousandfold mass, and so on, we should never exceed that length of time (T) which thus is the upper limit of the sun's age, if we are yet to keep to our concrete example. In plain English, the sun as such can not be older than 7.55 million million years. If we asked what mass the sun had before that time, say 8 billion years ago, the equation would give us an absurd answer, an imaginary mass, as a mathematician would put it."

TERTIARY BUTYL ALCOHOL

Following the post-war practice of cracking heavy petroleum to yield gasoline, certain leading oil refiners discovered that several kinds of alcohol could be made economically from the more volatile parts of the cracked oil. These alcohols have proved to be of great value, especially in the lacquer industry.

Unfortunately the oil refiner has to take what Nature gives him when he demolishes the large molecules of cheap, heavy petroleum. An appreciable fraction of one peculiar alcohol, the so-called tertiary butyl variety, turns up regularly by the thousands of gallons, and the present customers do not welcome it. It has eccentric chemical habits which do not fit the solvent industry.

Tertiary butyl alcohol is normally regarded by chemists as an academic curiosity. Its full industrial virtues have undoubtedly not been tested. Like grain alcohol, but unlike most of the newer alcohols, it mixes freely with water. It is readily frozen, more easily than water itself. It evaporates almost as freely as grain alcohol. The partial likeness of tertiary butyl alcohol to the ordinary alcohol suggests that it might be substituted for the latter in some of the host of industries using the older product. Such substitution would be a godsend to manufacturers who at present regard grain alcohol as indispensable, but are seriously hampered by the government prohibition restrictions.

For more than half a century chemists have known the structure of the molecule of the tertiary alcohol to be like a compact bunch of grapes rather than the more slender chains characteristic of its alcoholic brethren. The bunch-like molecular structure has suggested value as an anti-knock motor fuel. It is known that the more compact molecules in petroleum treat high-powered motors more kindly than do the snake-like type of gasoline particles. Tertiary butyl alcohol seems to follow the rule.

THE BREATHING OF INSECTS

Breath in an insect is not pumped in and out at the same opening, but circulates through the body, going in at one point and coming out at another. This is indicated by an ingenious experiment performed at the Hebrew University of Jerusalem by Dr. Gottfried Fraenkel, who is now at the Zoological Institute in Frankfurt-am-Main, Germany.

The mechanism of insect respiration has always been a more or less disputed matter. It has long been well known that insects do not breathe through a single opening, as man and all air-breathing vertebrates do. An insect has a row of holes along each side of its body, and from these openings many fine-walled branching tubes run into all parts of the interior, bearing oxygen directly to the tissues requiring it. Insects do not need and do not have anything resembling the oxygen-carrying blood corpuscles found in vertebrates.

The pumping or breathing motions of an insect's body, especially of its abdomen, have long been a matter of common observation. The question was whether this pumping drew air in and then pushed it out again at the same hole, or whether the air passed along to an exit elsewhere.

Earlier observers noticed that when certain insects swelled their abdomens certain of the breathing-holes were open and others shut. Then when the insects "breathed out," contracting their abdomens, the previously closed holes opened and the opened ones shut. This was taken to indicate a circulation of air, but did not prove it.

Dr. Fraenkel got more conclusive evidence in a most ingenious way. He slipped a locust's abdomen through a hole in a bit of thin rubber sheeting, and made the joint air-tight with collodion. Then he put the forepart of the insect's body into a glass cylinder, and the abdomen into a second cylinder; the rubber sheeting dividing the two like a diaphragm. Each glass cylinder was attached to a fine capillary tube at its outer end, and in this tube was a drop of liquid acting as a pointer. The movement of this drop of water indicated that under normal conditions the insect pulled air in through the openings of its abdomen.

Another disputed point which Dr. Fraenkel settled was the question whether insects keep up the pumping motions of their abdomens when they are flying. Obviously it is quite impossible to watch for this on an insect actually in the air. But Dr. Fraenkel found a way around this difficulty.

He noticed that many insects begin to fly instantly if their feet lose contact with a solid object. So he secured a wasp in such a way that it could buzz with its wings, but could not fly away. To the tip of the insect's abdomen he fastened a light pointer, to indicate whether movements took place. Then he lifted away the solid object against which the wasp's feet had been allowed to rest. Instantly the wings went to work, and as they did so the wasp's abdomen began to pump many times

as rapidly as it did when the insect was at rest. As soon as the foot-contact was restored the wasp ceased to "fly," and the pumping rate simultaneously fell off. The same experiment with locusts yielded similar results.

AFRICAN MARSUPIALS

MARSUPIALS, the remains of which have been discovered in Africa for the first time, seem to have originated in America. They were not in Australia, their present headquarters, until a geologic period considerably more recent than the dates of their oldest known American fossils.

The single find in Africa is of course not sufficient to serve as foundation for any reasonable inference as to the origin of a marsupial population of that continent. However, since European fossils similar to extinct American species have been found in the past, it might not be out of the way to suppose that this African form got in by way of Europe from an original homeland in America, while other marsupials made their way via Asia to Australia, over a land bridge that lay where the East Indian archipelago now is. This hypothesis would do away with the necessity for calling up again the oftenlaid ghost of the imaginary continent of "Lemuria."

The numerous opossum-like marsupials now found in South America, as well as their fossil relatives in South American rocks, represent a branch of the family that migrated southwards rather than eastwards. There is some evidence for a possible land-connection between South America and Australia, in certain Australoid fossils in South America; but this point is not out of the debating stage as yet. Marsupials with two incisor teeth to the jaw, like the recently found African specimen, were found in both South America and Australia.

North America's claim to the title of the first marsupial's homeland is based partly on the oldest known marsupial skull, an opossum-like piece of anatomy, found associated with the skull of a dinosaur in Montana not long before the war.

ITEMS

EVIDENCE that lack of vitamin A in the diet may be the cause of kidney stones has been reported by Drs. C. A. Elvehjem and V. F. Neu, of the University of Wisconsin. These investigators found that in birds the kidneys undergo definite, harmful changes when the birds are deprived of vitamin A. Other investigators, Drs. T. B. Osborn and Lafayette B. Mendel in this country, and Dr. Robert McCarrison in England, observed a similar relation between kidney stones and lack of vitamin A in laboratory animals. Recalling that kidney stones are particularly prevalent among peoples of the Far East, Dr. McCarrison fed animals on diets made up of foods common in India. More than one fifth of the animals developed kidney stones. When vitamin A was added to their East Indian diet, the animals did not have them.

If the sun is a chemical factory in which the light element hydrogen is being turned into other and heavier elements by tight packing together of atoms, then its life time may be only a hundredth of the age now estimated by most astronomers. This new and shorter estimate of the possible age of the sun is put forth in the annual report of the Smithsonian Institution by Theodore Dunham, Jr., of the Mount Wilson Observatory. The current estimate of the sun's age is on the order of a million times a million years. It is based on the assumption that the sun shines because matter is being burst asunder into pure energy. The opposite assumption, of matter in a light form being turned into matter in a denser form, would still call for some conversion of matter into energy, but not nearly so much.

Mankind is growing wheat much faster than it is eating it, so that much of the present distress in agriculture is due to an evil long familiar to manufacturing—simple overproduction. This was the thesis of an address by G. V. Jacks, of the staff of the Rothamsted Experimental Station, delivered before the British Association. During the last twenty years the world's wheat area has been increased by over 20 per cent., and production by over 25 per cent.; the increase in population over the same period has probably not been more than 14 per cent. The causes of this overproduction have been very complicated, and are hard to analyze; but economic, scientific and political factors have all played their parts.

THE U. S. Department of Agriculture has issued two new booklets with colored pictures of sick vegetables. These are intended for the guidance of market inspectors, dealers and all persons concerned with the handling of potatoes, tomatoes, peppers and eggplants. They show and describe the typical symptoms of the fungous and bacterial spoilages that attack these vegetables, as well as insect and other animal injuries and some of the "physiological" diseases. The authors are Dr. George K. K. Link, professor of plant pathology at the University of Chicago, and Dr. Glen B. Ramsey, senior pathologist of the Office of Horticultural Crops and Diseases, with headquarters at the university.

Positive rays or canal rays, which are streams of atomic particles resembling cathode rays except that they are heavier and carry a positive instead of a negative electric charge, are being speeded up far above their normal velocities in a special apparatus built by Professor Christian Gerthsen, of the University of Tübingen, who expects to use them in atom-smashing experiments. The apparatus consists of a vacuum tube with the usual electric terminals fused into it. Through the cathode or negative terminal is a narrow opening, and when the current is turned on the positive rays from the anode pass through this. Behind the pierced cathode are accessory pierced terminals, separated by chambers filled with hydrogen at extremely low pressures. Each of the charged terminals gives the positive ray an additional electrical push as it passes through, until finally its velocity has been stepped up to the desired point. Professor Gerthsen has reported his preliminary work to the German weekly, Die Naturwissenschaften, and promises full details in a short time.

Cook

Hydraulic High-Pressure Pumps

for pressures up to 500, 6,000, 10,000, 22,500, 75,000 lbs. per sq. inch.

For high-pressure gas research. Various types to meet all requirements.

Write for details, explaining your individual needs.

HERMAN A. HOLZ

Complete Line of High-Pressure Research Equipment for Gases and Liquids.

167 East 33rd St.

New York

HILGER OPTICAL INSTRUMENTS

BECAUSE of long experience in the importation of Scientific Apparatus, and close relations with Adam Hilger Ltd., we are well equipped to supply instruments made by this world-famous house.

Catalogs and price data will be mailed promptly upon request.

Typical Hilger Instruments Include:-

Spectroscopes,
Spectrographs,
Photometers,
Colorimeters,
Polarimeters,
Refractometers,
Interferometers,
Strain Viewers,
Audiometers,
Comparators,
Micrometers,
Diffraction Gratings,
etc.

JAMES G. BIDDLE CO.

ELECTRICAL AND SCIENTIFIC INSTRUMENTS

1211-13 Arch Street. Philadelphia. Pa.

The Printing of SCIENTIFIC PUBLICATIONS

The Science Press Printing Company has been established and equipped for printing scientific literature in the best way, with compositors, pressmen and proof-readers trained for technical work. It is a business corporation but it has been founded to provide facilities essential for the advancement of science.

The corporation owns its building at Lancaster, Pennsylvania. It has the best obtainable presses, composing machinery and binding equipment. What is more important, it has the most competent pressmen and compositors in a city which, since "Science" was first printed there in 1894, has become a center for fine scientific printing. The costs are much less than in the large cities.

The press prints "The Scientific Monthly," "Science," "School and Society," "The American Naturalist" and some twenty other scientific journals and publications. The typography and presswork of these journals will bear comparison with any weekly or monthly publication, although, for example, "Science" must be printed mostly in one day in an edition of over 14,000. "The Biographical Directory of American Men of Science" and "The Biographical Directory of Leaders in Education" are examples of the work of the press. It can, to special advantage, print scientific books, monographs and doctorate dissertations.

Samples of work and estimates of costs will be supplied on application.

The Science Press Printing Company Lancaster, Pa.

Publications of The New York Botanical Garden

Flora of the Prairies and Plains of Central North America

by Per Axel Rydberg, Ph.D.

A cloth-bound volume containing 969 pages, with 601 text-figures. It includes descriptions of 177 families, 1066 genera, and 3,988 species, keys to all groups, with glossary, etc. It aims to describe all the native and naturalized species of ferns, fern-allies, and seed-plants of Kansas, Nebraska, Iowa, Minnesota, South Dakota, and of parts of Illinois, Wisconsin, Missouri, Oklahoma, Colorado, Wyoming, Montana, Manitoba, and Saskatchewan. Published April, 1932. Price \$5.50, postpaid.

Serials

Journal of the New York Botanical Garden. Monthly; \$1.00 a year.

Mycologia, bi-monthly, devoted to fungi; \$5.00 a year.

Addisonia, quarterly, including colored plates and popular descriptions of flowering plants; \$10.00 a

North American Flora. Descriptions of the wild plants of North America; 71 parts now issued; \$1.50 per part for subscriptions to complete sets; certain parts separately at \$2.00 each.

certain parts separately at \$2.00 each.

Memoirs of The New York Botanical Garden. Technical papers; \$3.00 a volume (vol. VII, \$5.00).

Brittonia, A series of botanical papers; \$5.00 a volume.

Address The New York Botanical Garden

Address The New York Botanical Garden Bronx Park (Fordham Station) New York, N. Y.

Cook HIGH-PRESSURE GAS COMPRESSORS

for pressures up to 300 atm., capacities of 60 to 80 cu. ft. per hour, at 300 atm.

Simple, Small, Efficient.

Specially developed for compressing oxygen, hydrogen, rare, noxious, or poisonous gases.

Write for details, stating your individual needs

HERMAN A. HOLZ

Complete Line of High-Pressure Research Equipment for Gases and Liquids.

167 East 33rd Str.

New York

THE WISTAR INSTITUTE BIBLIOGRAPHIC SERVICE

ISSUES

AUTHORS' ABSTRACTS

of all papers appearing in the journals listed below prior to publication of the articles in full. By this advance information biologists may familiarize themselves with contemporary research in a minimum of time

Advance Abstract Sheets are issued twice a month, each sheet containing ten or more authors' abstracts. Subscription rate is \$3.00 per year.

Bibliographic Service Cards, following the Advance Abstract Sheets, also are issued twice a month. In addition to the authors' abstracts, the cards provide subject headings and complete bibliographic reference. The cards are convenient for filing and library records. Price, \$5.00 per year.

Price, \$5.00 per year.

At regular intervals the authors' abstracts are assembled and published in book form with complete authors' and analytical subject indices. Price, \$5.00 per volume. Liberal discount to subscribers to the Bibliographic Service Cards.

JOURNAL OF MORPHOLOGY
THE JOURNAL OF COMPARATIVE NEUROLOGY
THE AMERICAN JOURNAL OF ANATOMY
THE ANATOMICAL RECORD
THE JOURNAL OF EXPERIMENTAL ZOÖLOGY
AMERICAN ANATOMICAL MEMOIRS
AMERICAN JOURNAL OF PHYSICAL ANTHROPOLOGY
JOURNAL OF CELLULAR AND COMPARATIVE PHYSIOLOGY
FOLIA ANATOMICA JAPONICA (Tokyo, Japan)
PHYSIOLOGICAL ZOÖLOGY (Chicago, Illinois)
STAIN TECHNOLOGY (Geneva, New York)
ECOLOGICAL MONOGRAPHS (Durham, North Carolina)

The Wistar Institute of Anatomy and Biology

Second Edition: Revised and Enlarged

THE RAT: DATA AND REFERENCE TABLES

Memoir No. 6: 458 pages. Bibliography: 2206 titles HENRY H. DONALDSON

Published by The Wistar Institute Philadelphia, Pa., U. S. A. Price, \$5.00

The Rat: A bibliography, 1924-1929.

L. E. DRAKE and W. T. HERON 1353 titles—with subject index.

Price-50 cents

Orders may be sent to

The Wistar Institute, 36th Street & Woodland Ave., Philadelphia, Penna.

CHEMICAL, MEDICAL AND SCIENTIFIC PERIODICALS, For sale

Complete sets, volumes and back issue copies.

Books no longer obtainable at the publishers.

Exchanges with Libraries solicited.

B. LOGIN & SON, INC. Est. 1887 29 East 21 St., New York

A Hoke-Jewel Blowpipe

is a necessity in working Pyrex and quartz; brazing; soldering; etc. Will melt platinum. Ask for folder S-5.

Hoke Incorporated 22 Albany St., New York City.



are

bee

inv

at

whi

Mo

331

the

inte

mou

ton

film

and

infr

"cy

are

dark

TE

proto

them

"e"

neutr

Wills

in a

B

SCIENCE NEWS

Science Service, Washington, D. C.

THE NOBEL PRIZE AWARD IN CHEMISTRY

(Copyright, 1932, by Science Service)

THE founders of the research laboratory of the General Electric Company had seen a new industry grow up around the fundamental scientific work of Faraday and others, and, men of vision that they were, they saw that they should not be content merely to apply the principles discovered by others, but should themselves support such fundamental research and so aid in the discovery of new principles for the further development of the art.

This led to the establishment by Dr. W. R. Whitney of a new type of industrial research laboratory, devoted largely to fundamental research. From the beginning Dr. Whitney insisted that each research worker should be free to publish his results in his own name so that each would be assured of such scientific recognition as his work merited.

The Nobel Prize award in chemistry to Dr. Irving Langmuir proves that important fundamental research can thrive in an industrial laboratory and that it is possible for a man connected with such a laboratory to receive the highest public recognition.

The scientific world is familiar with the many important contributions to science that Langmuir has made, and the general public, knowing of the major applications of the results of his researches, has clear evidence that fundamental research may be made to pay.

But only those in our laboratory can properly appreciate the value of another phase of Dr. Langmuir's work. While through his own researches he has been making large contributions to the growth of fundamental knowledge, he has been constantly helpful to others, not only in our own organization but also outside of it.

While most of his own efforts have been directed to fundamental research in physics and chemistry, he has always been interested in the application of scientific knowledge to human needs, and the same brilliancy in analysis, in reasoning and in scientific imagination which has enabled him to achieve so much in basic research, has always been applied generously and helpfully to the multifarious practical problems of his associates in the laboratory.

Langmuir's work shows that a man can serve science greatly and at the same time serve industry both by broadening the basis on which that industry rests and by the application of fundamental scientific methods to practical problems.

The Nobel award to Langmuir should be helpful to both science and industry. It should stimulate industry to seek for scientific workers of the highest ability and to support their efforts, and it should reassure scientific men that by accepting such support they are not precluding themselves from that recognition they most value, the recognition of merit in their work by fellow scientific men.—W. D. COOLIDGE.

SURFACE CHEMISTRY

(Copyright, 1932, by Science Service)

EVERY scientific research man, to reach the greatest achievement, must have a deep curiosity and an intense enthusiasm for discovering new important facts or new relations between known phenomena. During the course of his work he derives great pleasure from the progress he makes in these directions. His greatest satisfaction, however, is to see that his results are willingly used by others and is derived particularly from the recognition that his work receives from his fellow investigators.

My own work has been in the field of both chemistry and physics. I have been especially interested in the mechanism of chemical reactions which take place on solid surfaces.

At present I am engaged in working out the laws according to which atoms and molecules distribute themselves over surfaces forming single layers of atoms. These laws are of importance in understanding many simple phenomena such as those of lubrication and of the spreading of oil films on water.

The forces that hold atoms or molecules on the surfaces of solids or liquids are just as varied in their nature as those forces which determine the chemical and physical properties of substances in bulk. In other words, we must recognize that the chemistry and physics of surface phenomena are subjects almost as broad and as complex as the whole field of chemistry and physics. It has too often been thought that a single equation, such as a so-called "adsorption isotherm," could be devised to cover all surface phenomena.

The importance of this field of surface chemistry is really just beginning to be realized. There is much pioneer experimental and theoretical work to be done to establish even the fundamental principles which should guide investigations of these phenomena. What we need particularly is to study in great detail and with high accuracy a few typical simple examples of adsorption.

Dr. John Bradshaw Taylor and I are attempting to do this through an exhaustive study of the electrical and chemical properties of monatomic films produced on the surface of tungsten filaments when they are brought into contact with vapors of the alkali metal such as caesium or potassium. The effect of adding minute amounts of oxygen is of particular interest. Oxygen and caesium represent substances of two extreme types and so by working with surfaces that contain both kinds of atoms in varying proportions a very wide range of surface phenomena can be investigated.

The delicacy of the methods that can be evolved to detect caesium or oxygen atoms on surfaces is quite extraordinary. For example, it should be quite possible if desired to detect the presence of caesium atoms inside a vacuum bulb even if the average concentration of atoms in the space is only about one atom per cubic meter.

We intend to continue such investigations until we have obtained far more fundamental knowledge of surface phenomena than we have at present.

-IRVING LANGMUIR.

THE PENETRATION OF CLOUDS AND FOG BY INFRA-RED RAYS

How photographic plates more sensitive than the human eye catch light waves, just a little too long to be visible to man, was told the Franklin Institute by Dr. Gilbert E. Doan, associate professor of physical metallurgy at Lehigh University.

Even though infra-red radiation does not affect the eye's retina to give the sensation of light, it penetrates clouds and fog which shut out visible light, Dr. Doan stated. So, he continued, when a sea captain wishes to take his bearings from the sun at noon on a cloudy day, when the sun is invisible, he points a reflector, somewhat like an automobile headlight, toward the zenith, and rotates it until in a certain direction the sensitive thermocouple inside the reflector gives a maximum reading. That is the direction of the sun and from this position and his charts he calculates the latitude and longitude of the ship.

The infra-red rays from the sun pass through the clouds and, after striking the reflector, are concentrated on a bismuth-silver thermocouple which registers a maximum on the attached galvanometer when the reflector is pointed directly at the sun. The instrument is said to be so sensitive that it will record the heat rays from a man's face a mile away.

This penetration of the infra-red rays through haze and clouds is now used also to photograph objects which are invisible to the eye. The city of Washington has been photographed from the air while covered with a blanket of fog and smoke so dense that the city was invisible to the aviator who took the picture. Mountains at a distance are frequently hidden by atmospheric haze, which produces what artists call "aerial perspective." Mount Shasta has been photographed from a distance of 331 miles. The aviator could not see it at all. Due to the fact that the earth's surface is curved, the view is interrupted about midway between the camera and the mountain

By this method an aviator flying 20,000 feet over Dayton could easily photograph the city of Detroit. Such films are also used by astronomers in photographing stars and eclipses. Special Eastman films made sensitive to infra-red rays by the presence of a chemical called "cyanine" are used for this purpose. Since these rays are invisible, it is possible to take photographs in the dark, that is, in total darkness as far as the eye can see.

PROTONS AND NEUTRONS

THE atomic building blocks of unit mass, known as protons and neutrons, may have electrical charges upon them that vary in magnitude from six times the famous "e" charge to no charge at all as in the case of the neutron. This is suggested by Dr. M. Delbruck, of the Wills Physical Laboratory of the University of Bristol, in a communication to Nature.

The charge "e" is that found negatively on the electron and the positive charge normally on the proton, or positive electron, is of the same magnitude but of the opposite or positive sign. Dr. Delbruck suggests that unit particles may have arbitrary, positive and negative values of charge which under the quantum theory may vary only by multiples of "e".

This new suggestion may explain, in Dr. Delbruck's opinion, the secondary radiations of high energy and ionizing power that cosmic rays produce when they smash into the atmosphere. These extremely vigorous radiations have been detected along the tracks of cosmic rays both in America and Europe, Dr. Delbruck considers them likely to be particles of mass one and charge between five and six times "e".

He believes that the highly charged unit particles may also explain the puzzling fact that cosmic ray particles are absorbed largely high in the earth's atmosphere. He visualizes unit cosmic rays as particles of mass one created in interstellar space with high positive charges. These do not collect electrons for compensating their charge until they enter the earthly atmosphere. There they pick up electrons and lose part of the charge. The ionizing or electrifying power thus decreases due to loss of charge, rather than because of reduction of number of particles as it is now assumed to be the case.

FADING RADIO SIGNALS AND WEATHER FORECASTS

FADING of radio signals, so annoying to most broadcast listeners and especially to those specializing on longdistance receptions, promises to help meteorologists to make weather forecasts.

This is pointed out in *Nature*, by Professor R. C. Colwell, of the Department of Physics of West Virginia University. Forecasts made by this method during experiments ranging over four years were, he says, ninety per cent. correct.

Professor Colwell and Professor Ivo Ranzi, of the University of Camerino, Italy, have reached almost identical results, although their observation stations are situated in zones with quite different climatic conditions, and though Professor Ranzi's observations have been made with a 100-meter wave and Professor Colwell's with the 309-meter wave of KDKA, Pittsburgh.

Professor Colwell's reception point has been at Morgantown, West Virginia, sixty miles south of KDKA. He found that when a high-pressure area covered both Pittsburgh and Morgantown, the day signal from KDKA is stronger than the night signal, while the night signal is the stronger when a low-pressure area is present.

Both professors believe that these variations are due to changes that occur in what is known as the E stratum of the Kennelly-Heaviside layer in the upper atmosphere. During daylight radio waves are reflected from the E stratum, which is ionized by solar radiation. When, usually about the time of sunset, this ionization markedly decreases, the reflection starts to take place in the F stratum.

The advance of a depression from the north tends greatly to increase the ionic density in the E region,

from which, therefore, radio waves continue to be reflected after nightfall. When, however, an anticyclone prevails or depressions are located to the south, ionization of the E stratum rapidly lessens as the day proceeds, and reflection may start to take place in the F stratum in the afternoon.

The prolonged drought in his section of the country has forced Professor Colwell temporarily to discontinue his investigation, which can not readily be made when weather conditions remain persistently settled.

PLEISTOCENE EAGLES

THE region about Los Angeles during the great Ice Age harbored eight species of large, eagle-like birds. To-day there are only two and those but rarely seen.

The Pleistocene eagles are represented by their remains found in the asphalt pits at Rancho La Brea, form the basis of a study recently completed by Dr. Hildegarde Howard, of the Los Angeles Museum. The collections of that museum include over thirteen thousand bones of eagles. The still existent golden eagle accounts for 9,500 of these bones, and the American or bald eagle for 1,750. The remaining 2,000 or more belong to species now extinct.

The extinct species were originally described by Dr. Loye Miller, of the University of California at Los Angeles, with the lower leg bone alone serving as the type specimen of each. It is only now that the other skeletal parts have been studied. In her recent work, Dr. Howard has made a careful study of all of the principal elements in an endeavor to reconstruct the complete skeleton of each species and thus facilitate the determination of the nature and relationships of the birds.

Four of the extinct species find their nearest relatives to-day in the Guiana harpy, the crested eagle and the urubiting of Central America. The rarest and most bizarre of these possessed legs nearly equal in length to those of the little brown crane, though slightly stouter. Although one might suppose an eagle of this type to be related to the secretary bird of Africa, in reality it is closer to the long-legged urubiting a hawks.

Two other extinct species show relationship to the vultures of the Old World. One of these is so close as scarcely to be distinguished from the Egyptian vulture in certain of its skeletal elements. The other is remarkable in that though it appears to have been genetically related to the vultures, it exhibits the characters of well-developed beak and feet usually associated with the true eagles.

ITEMS

An elevation of almost a mile is reached on a new highway built in the Great Smoky National Park near Bryson City, North Carolina, by the North Carolina State Highway Commission. The exact height reached is 5,044 feet above sea-level, and engineers believe this to be the highest point on a state highway system east of the Rockies. It was pointed out that roads leading to the summits of Mount Mitchell and Mount Washington reach greater elevations, but these do not belong to state highway systems. The new road crosses the rugged Great

Smoky area, most of which is above 4,000 feet with many peaks close to 6,500 feet. In spite of the broken character of the country a standard highway has been built on the greater part of which a speed of 45 miles per hour can be maintained in safety. Much additional road building is to be done in the park by the U. S. Bureau of Public Roads for the National Park Service. The Park Service estimates that in the near future more than 2,000,000 people will visit this area in cars each year. Yellowstone had only 400,000 visitors in 1931.

Amor is the new companion of Eros, formerly most famous of the minor planets or asteroids. This name has been given to the planet discovered by E. Delporte at Uccle in March of last year. It won particular notice among astronomers when it was discovered that it approached the earth closer than Eros itself, which before held the record. Shortly after the discovery of Amor's close approach to the earth, another little planet, discovered by K. Reinmuth, approached even more closely to the earth. Amor also has the number 1221. The Berlin Rechen-Institut, which numbers the new planets discovered, has assigned permanent designations to fifteen new planets discovered between 1927 and 1932. Amor in mythology was identical with Eros.

LUTHER BURBANK has been granted his seventh posthumous plant patent by the U.S. Patent Office. The latest patent covers a new variety of cherry tree "characterized by its vigor of growth, the toughness of its wood, and the large size and absence of susceptibility of cracking and rot of its fruit." Burbank has so far been granted more patents through his executrix, Elizabeth Waters Burbank, than any other plant breeder. Five of his patents issued this year are for new varieties of plums and one for a yellow freestone peach. Three other plant patents have been issued recently, making a total of forty-three patents issued since the plant patent law was passed a little more than two years ago. Included in the new plant patents are a variety of barberry without spines; a new grape characterized by its early ripening, exceptionally large size, and superior quality of its fruit; and a freesia having a "long, pure white, gracefully tapering perianth and flat opening floral seg-

LICENSE plates will be much more legible in future if the advice of psychologists is followed in selecting the finish, colors and size and shape of letters. Only 28.9 per cent. of plates are visible at the distance you would expect to read them, it was found in the course of experiments conducted in the psychological laboratory of Iowa State College under the direction of Dr. Alvhh R. Lauer. The ideal plate should have a dull finish, Dr. Lauer concludes. Dark letters such as greens or blacks are best, and they should be printed on a light background. Bright yellow is very good for background. Difference in color is not so important, however, as difference in ability to reflect light. Numbers should be three times as high as they are wide and the space between them should be half as wide as the number itself.

McGRAW-HILL=

announces a new textbook for beginning courses

GEOLOGY

By William H. Emmons, Professor of Geology, University of Minnesota; George A. Thiel, Associate Professor of Geology, University of Minnesota; Clinton R. Stauffer, Professor of Geology, University of Minnesota; and Ira S. Allison, Professor of Geology, Oregon State Agricultural College

514 pages, 6 x 9, illustrated, \$4.00

The aim of this text is to give the college student a comprehensive knowledge of the materials of the earth and of the processes that operate at the earth's surface and that have operated in the past to form the earth.

Unusual clarity is achieved through a logical organization of material: the early chapters discuss the processes more commonly observed in operation; the later chapters deal with those processes less frequently encountered. The book covers the whole field of physical geology and in addition contains a brief outline of historical geology. A notable feature of the text is the exceptionally large number of fresh, interesting illustrations.

CHAPTER HEADINGS

I—INTRODUCTION

II—NATURE OF MATERIALS THAT CONSTITUTE THE EARTH

III-WEATHERING

IV-THE ATMOSPHERE

V-GROUND WATER

VI-GRADATIONAL WORK OF STREAMS

VII-GRADATIONAL WORK OF SNOW AND ICE

VIII-LAKES AND MARSHES

IX-THE OCEAN

X-SEDIMENTARY ROCKS

XI-DIASTROPHISM

XII-VULCANISM

XIII—MOUNTAINS, THEIR ORIGIN AND STRUCTURE

XIV-METAMORPHISM

XV-STRUCTURES OF ROCKS

XVI-MINERAL DEPOSITS

XVII—PROBABLE CONDITIONS WITHIN THE EARTH

XVIII-A BRIEF OUTLINE OF EARTH HISTORY

Send for a copy on approval

McGRAW-HILL BOOK COMPANY, Inc.

McGraw-Hill Building

330 West 42nd Street

New York

CHARLES SCRIBNER'S SONS

NEW YORK > LONDON

& PRINCETON UNIVERSITY PRESS

Henry Fairfield Osborn

Biological Series (1894-1929) Scribners

I. FROM THE GREEKS TO DARWIN

New and completely revised edition of this standard historical work. 12mo. 3d thousand. Translations: Italian, Bulgarian.

II. IMPRESSIONS OF GREAT NATURALISTS

Sequel to Vol. I. Darwin, Wallace, Huxley, Balfour, Bryce, Pasteur, Leidy, Cope, Butler, Burroughs, Muir, Roosevelt. With portraits. 12mo. New and extended edition. 4th thousand. \$2.50

III. EVOLUTION AND RELIGION IN EDUCATION

Discussion with Bryan and other Fundamentalists of 1922-25. 12mo. 12th thousand. \$2.00

IV. CREATIVE EDUCATION

"I rejoice that you have put your ripe experience into this brilliant book. It is tonic."—WILLIAM McAndrew. With portraits. 12mo.

Life History of Earth and Man Series (1907-1928) Scribners

I. THE ORIGIN AND EVOLUTION OF LIFE

On the theory of action, reaction, and interaction of energy. Profusely illustrated. 8vo. 12th thou-\$4.00

II. THE AGE OF MAMMALS

New and revised edition now in preparation. Profusely illustrated. 8vo. Translations: French, German, Spanish, Japanese.

IV. MEN OF THE OLD STONE AGE

Standard work in human archæology of the Palæolithic Age. Profusely illustrated. Thirteenth printing. Cr. 8vo. 24th thousand. \$5.00

Princeton University Press

V. MAN RISES TO PARNASSUS
Sequel to Vol. IV. Intellectual and spiritual evolution of man to close of New Stone Age. Illustrated. 8vo. 3d thousand. Translation: Rus-\$2.50

VI. COPE, MASTER NATURALIST

Life and Letters of Edward Drinker Cope. Foundations of natural history and vertebrate palaontology in America. Complete bibliography, classified and annotated. Profusely illustrated. 8vo. \$5.00

Scribners

FIFTY-TWO YEARS OF RESEARCH. OBSERVATION AND PUBLICATION

Scientific biography; complete chronologic and classified bibliography, 1877-1931. Portraits. \$1.50

Supt. of Documents Government Printing Office, Washington

THE TITANOTHERES OF ANCIENT WYOMING, DAKOTA AND NEBRASKA

Monograph 55 of U.S. Geological Survey. Vols. I and II, 882 pp., 797 text illustrations, 236 plates. Thirty years in preparation, a complete research in Geology, Palæontology, and Biology. 300 copies remaining of original 1600. \$9.00

Announcing

The First English Translation of

FELIX KLEIN'S

Elementary Mathematics

from an

Advanced Standpoint

Made from the Third German Edition by

E. R. HEDRICK and C. A. Noble

Professor of Mathematics in Professor of Mathematics in the University of California the University of California at Berkeley at Los Angeles

THE privilege of familiarity with this work of the distinguished German investigator and teacher has long been anticipated by American mathematicians. With the rareness of genius Dr. Klein combined familiarity with all the fields of mathematics and the ability to perceive the mutual relations of these fields. As a teacher it was his ambition to present mathematics—even in the lower schools-not as a series of isolated disciplines, but as an integrated, living organism. This book, which is the essence of his life-time of efforts toward improving the teaching of mathematics in secondary schools, both as to the material which should be taught and the way in which it should be presented, embodies this ambition. From the vantage point of his own extended knowledge and keen insight he scrutinizes the content and method of three branches of elementary mathematics—arithmetic, algebra, and analytics—and penetrates to the depths below their surface meanings.

There is at present nothing comparable with this book, in our language or any language, either in respect to its skillfully integrated material or the fascinating way in which this material is presented. It will be a rich source of stimulus for teachers. As a text for advanced students it will provide an excellent means for review, an ideal preparation for teaching activities.

> Cloth, Crown Octavo 274 pages, 125 figures \$3.00

THE MACMILLAN COMPANY

60 Fifth Avenue

New York

SCIENCE NEWS

Science Service, Washington, D. C.

THE LEONID METEOR SWARM

Fears of astronomers that the expected display of Leonid meteors might again fail to appear, as in 1899, have been justified. Observing from the Flower Observatory of the University of Pennsylvania, of which he is director, Dr. Charles P. Olivier, president of the Meteor Commission of the International Astronomical Union, observed these shooting stars at the rate of thirteen per hour, during the early morning hours of Wednesday, November 16. Correcting for the proximity of the bright moon, this would mean that about thirty might have been seen every hour after midnight had the sky been dark. This is far inferior to the display of last year, which it was hoped might be the forerunner of a brilliant shower this month, possibly rivaling that of 1866.

Though Dr. Olivier is awaiting reports from observers in other parts of the world in the hope that the shower might have reached the earth during daylight hours here, he thinks it unlikely.

It seems probable that the damage done to the meteor swarm by Jupiter before 1899, in pulling aside the center part so much that it missed the earth, though the beginning and end reached us in 1898 and 1901, has not yet been repaired. It had been thought that Jupiter might since have pulled the swarm into line again. Thus it seems likely that 1933 may also be deficient in meteors of the Leonid swarm, but that in 1934 we may have one like last year's. Or we may have a shower like that of 1901, when the meteors fell at the rate of more than a hundred an hour.

But Dr. Olivier again emphasized the uncertainty of predicting the behavior of meteors, since we only see them in their dying moments, and unlike other astronomical bodies can not observe them over a large part of their orbits.

During the Leonid meteor shower on the night of November 15-16 radio pulse measurements were made at the Bell Telephone Laboratories at Deal, New Jersey. In the opinion of J. P. Schafer and W. M. Goodall, who carried out these tests, the results confirm the theory that meteors cause sufficient ionization in the layers of the upper atmosphere to reflect short-wave radio signals. It is a well-known fact that there are two ionized regions which reflect short-wave radio signals. Coincident with the occurrence of visible meteors overhead, the ionic density of the lower layer was often observed to increase. This ionization was usually found to last from twenty seconds to two minutes; at times, much longer. The same investigators had previously made observations during all the more important meteor showers of 1931 and 1932, but unfavorable weather conditions had prevented a direct correlation between the measured increases in ionization and the passage of meteors overhead. This correlation has now been obtained, although at times during the night clouds obscured portions of the sky.

CHEMICAL ATTACK ON CANCER

WITH test-tubes and gases, a government chemist is attacking the cancer problem. At the science forum of the New York Electrical Society on November 16, Professor Carl Voegtlin, of the U.S. National Institute of Health, reported progress along three lines of chemical investigation looking toward a cure of the disease.

He has recently made a fundamental observation which may have a far-reaching influence in the study not only of cancer, but of other diseased conditions. This observation is that in both normal and cancerous tissues in the test-tube, it is an easy matter to break down the cell albumen in an atmosphere of nitrogen. It may be built up again in the presence of enough oxygen, and then broken down again in nitrogen.

Albumen is perhaps the most essential component of cells. It is present in all living matter. It determines to a considerable degree the specific behavior of different cells. Without a building up of the albumen molecules, cells can not multiply indefinitely.

Cancer is considered by most of its students as a disease of certain cells which leads to their unrestricted multiplication and their destructive action on surrounding normal cells, Professor Voegtlin explained. Consequently, his discovery of the rôle of oxygen in the building up of albumen in tissues, and of the fact that cancer tissue uses oxygen faster than normal tissue, is of considerable significance.

The cancer-fighter is constantly seeking a chemical which will check the cancerous growth. Copper compounds added in infinitesimal amounts to tissue cells growing in the test-tube were found to check cell division. These copper compounds were regular cell components. On the other hand, glutathione, a sulfur-containing substance, under certain conditions favored the division of cells.

Of interest in connection with the claims for lead treatment of cancer is the observation made by Professor Voegtlin that of all the metals tried, only lead salts had an injurious effect on the cells. While lead may have some value in treatment, it is too dangerous to the patient to be of general usefulness, he said. Iron, manganese, cobalt and zinc in similar concentrations to that of the copper had no appreciable effect. The action of other chemicals is being studied at present.

"Another important chemical factor which may operate in the growth of cancerous tissue is the relative acidity of the tissues," Professor Voegtlin said. He and his associates studied this problem in living animals affected by cancer. They devised a new method for this research.

"The acidity of cancerous and normal tissue is measured by a fine glass capillary electrode which is carefully inserted into the tissue and connected with a suitable physical measuring equipment. It was found that malignant tissues show an acid reaction even in the early

stages of growth. Normal tissues were found to be slightly alkaline, as is also normal blood,"

While these various lines of attack are still in the laboratory stage, Professor Voegtlin is hopeful that they will lead to a chemical treatment of cancer.

RESEARCH ON TYPHUS

ARISING from his sick-bed, where he has been recuperating from an attack of typhus fever acquired during his investigations of it, Dr. R. E. Dyer, of the U. S. Public Health Service, addressed the New York Electrical Society on November 16.

Dr. Dyer reported the investigations by which he and his colleagues found that the American form of mild typhus fever is carried from wild rats to man by rat fleas. Dr. Dyer pointed out that "epidemic typhus fever has been a scourge in Europe for many centuries and has been introduced into the eastern part of the United States from time to time in connection with immigration. In 1910 Dr. Nathan E. Brill, of New York, described a disease which was subsequently identified as typhus by the U. S. Public Health Service. This disease is known as endemic typhus or Brill's disease."

Dr. Dyer also pointed out the differences between epidemic typhus of European countries, which has a death rate of 20 or 22 per cent., and the mild American form, which has a death rate of about one per cent. "European epidemic typhus has its greatest prevalence in winter; it is associated with crowding; it is most prevalent in the lower strata of society; multiple cases in households, jails and hospitals are common; it is spread from man to man by the body louse. Endemic typhus has its greatest prevalence in summer and fall; it is not associated with crowding; there is no predilection for the lower strata of society; there is no evidence of spread from man to man. Dr. K. F. Maxey, of the U. S. Public Health Service, made a study of this disease and obtained no evidence suggesting louse transmission."

Dr. Maxey's discovery that persons employed in food-handling establishments were exposed to an increased risk of infection to this disease led to the theory that a rodent reservoir existed. Dr. Dyer himself isolated the virus which causes the disease from wild rats and rat fleas obtained at premises where human cases of the disease occurred. Subsequent studies gave proof that the disease attacks persons working in contact with wild rats and that it is transmitted by the rat flea. "Through this work the U. S. Public Health Service has pinned one more disease on the lowly rat," Dr. Dyer concluded.

AN ELECTRICAL MOSQUITO TRAP

A NEW electrical mosquito trap for use in malaria prevention is being investigated by the U. S. Public Health Service, Surgeon-General Hugh S. Cumming told members of the New York Electrical Society at their science forum on November 16. The surgeon-general devoted most of his address to a description of the U. S. National Institute of Health.

Surgeon-General Cumming stated that "at this institute, which is a branch of the Public Health Service, the

federal government maintains a staff of experts whose job it is to delve into the unknown and develop such facts as they can on matters pertaining to the public health."

Not all phases of these researches are carried out purely as laboratory experiments. In the control of malaria, for example, the institute cooperates with field workers, blood examinations being made at the institute, while the men in the field test the value of new drugs in treating the disease and of new larvicides for controlling the production of the disease-carrying mosquitoes.

"As an adjunct to the latter, a new type of mosquito trap is under investigation which employs scientific discoveries in the electrical field all the way from light to sound," said Surgeon-General Cumming. "A trap is under study where the attractiveness of different colored lights in conjunction with the inflowing draft from a suction fan is being combined with the possible attraction for the flying mosquito to differing musical notes. An apparatus has been constructed, the hum of which closely resembles the hum of a mosquito. We propose to determine which note is the most attractive.

"The instrument consists of a decade system of condensers which vary by 1/10,000 of a micro-farad and one variable condenser capable of varying from 1/1,000 of a micro-farad by imperceptible gradations to practically zero. These will produce notes with a vibration frequency from approximately 128 per second to 7,500. These notes, through the delicacy of the condenser system, can be varied by intervals of 1/40 of a major tone by changing the frequency as little as one cycle per second at the lower end of the scale and 20 cycles per second at the upper."

ARROWHEADS FOUND WITH NEW MEXICAN FOSSILS

THE discovery of man-made objects associated with fossil animal remains, made by road-builders working near Clovis, New Mexico, has led the Philadelphia Academy of Natural Sciences and the University of Pennsylvania Museum immediately to send to the site Edgar Howard, research associate of the two institutions, to see that full scientific information is obtained before the evidence is destroyed in the course of further road construction.

The importance of this locality was recognized by Mr. Howard in the course of his explorations last summer, when a local investigator, A. W. Anderson, brought to his attention several specimens of an unusual type of arrowpoint, and from fossils found near by of several types of animals long extinct on this continent, among them a tooth of a mammoth, which led to the possible conclusion that man had lived in this area at a very remote period.

The University of Pennsylvania Museum and the Philadelphia Academy of Natural Sciences had been developing plans to study the archeological and paleontological problems of this site near Clovis next spring, but the news of the finds in the course of the construction of the road indicated the need for immediate action.

The site was apparently the bed of an ancient lake, long since dried up. Here the animals came for water, and here, it is supposed, the primitive hunters waited to kill them. A considerable number of the distinctive arrowpoints have been picked up in this area. They show a surprisingly high technical quality. Other points of this same type have been found in the Southwest in recent years, the most striking discovery being at Folsom, New Mexico, where the points were found in close association with an extinct species of bison.

In the summer of 1931, Mr. Howard discovered another characteristic specimen in a cave near Carlsbad, New Mexico. It was found several feet below a stratum of the remains of the Basket Makers, recognized as one of the earliest peoples to inhabit these regions.

Much evidence, therefore, seems to support the supposition that these new arrowpoints were the products of a race of man long antedating the Indians known to have existed on this continent. If it can be determined with what animals these were associated, an approximate date may be established for the coming of man to the Western Hemisphere.

ITEMS

HALF a century ago, and years before even the crudest wireless sets were made, Thomas A. Edison devised a vacuum tube that can be used to-day to pick up broadcasting. But Edison failed to become the father of modern radio. Business in his laboratory was so pressing that he left to others the work of developing radio as it is known to-day from his tube discovery. Proof of the ability of Edison's early tube to detect radio signals was given on November 21, in an anniversary program arranged by the New York Electrical Society and Electrical Testing Laboratories. An exact replica of the old tube detected the sending, from a small transmitter in the studio, of music of the 1880's and in turn delivered this sound to the microphone of the network for rebroadcasting throughout the country.

PLATEOSAURUS, the ancestor of all dinosaurs, is "at home" in the Harvard Museum of Comparative Zoology. An eighteen-foot skeleton, the first mounted specimen of this particular dinosaur to be exhibited in any museum in this country, has been received from Germany, where its scattered bones were found in a deposit in Württemberg. Plateosaurus was apparently a flesh-eater, for the skull is armed with sharp-pointed teeth; yet he was ancestor to the great lumbering herbivorous dinosaurs like Diplodocus as well as to the smaller but more active Tyrannosaur tribe. Like the latter group, Plateosaurus walked on his hindlegs and apparently used his shortened, claw-armed forelegs for holding his prey. His forefeet have five toes, instead of the three of later dinosaurs, but two of the toes already show signs of evolutionary degeneration. The geologic age of Plateosaurus is Upper Ariassic. This dates back some 160 million

Dr. John B. Youmans, of Nashville, reported to the American Society of Tropical Medicine, on November 17, that epidemics of dropsy, or edema, have been occurring regularly at certain seasons in Tennessee. The condition seems to be the result of a diet low in calories and in proteins. This diet is more the result of habit and custom than it is of poverty, Dr. Yeumans said. "In itself the edema probably causes little harm," he said, "but the chronic starvation, particularly of protein, that it apparently represents, may cause serious disorders. The principal remedy is to be found in public-health education, in which more attention should be paid to diet."

AMOEBAE, tiny parasites that cause one type of dysentery, have more disease-producing ability when they are taken from active cases of the disease than when they are taken from symptomless carriers. Likewise, these parasites are more potent for producing disease during an epidemic than when the infection is less active. These conclusions, based on studies of the parasite in kittens, were reported to the American Society of Tropical Medicine by Drs. Henry E. Meleney and William W. Frye, of Nashville, Tennessee.

LIGNIN, one of the chief constituents of wood, and as yet one of the most puzzling to chemists and industrialists, has been made artificially in the U.S. Forest Products Laboratory at Madison, Wisconsin, by Drs. L. F. Hawley and E. E. Harris. This research followed pioneer work done previously by Dr. Hawley with Dr. Jan Wiertelak. The results have been reported to the American Chemical Society through its official journal. Lignin was made in sealed tubes, by heating cellulose, the most useful constituent of wood, at a temperature of 135 degrees Centigrade (307 degrees Fahrenheit) for periods up to eight days in length. The artificial lignin thus obtained gave the same reactions as the natural lignin to various chemical tests. It is not expected that this artificial lignin will be of immediate direct commercial importance. But the discovery of Drs. Hawley and Harris will eventually be of economic value, because it leads to a better knowledge of what lignin is and will do, and this knowledge in turn is of use either in getting rid of it or even in finding a profitable occupation for it.

GOLDEN snow often may be seen in the mountains of Glacier National Park late in the winter. The effect is caused by great numbers of brilliant canary-yellow insects, about one sixteenth of an inch long, covering the snow. Others float on standing pools of water, giving it a golden glow. These colorful little insects exist for a few days only, and are carried off with the run-off from the melting snow. Collectively they are known as "collembola," a name which, derived from the Greek, means "glue-pegs," and comes from their habit of exuding a sticky fluid which enables them to adhere to smooth surfaces. In lieu of wings, some species carry a caudal furcula which serves as a springing organ to catapult its possessor through the air. When not in use, this spring is folded forward under the body and kept in place by a convenient abdominal catch. Their common name, "spring-tails," is derived from this springlike arrangement, as probably is also the local name of "snow flea."

RECENT SCIENTIFIC BOOKS

which by arrangement with The Science Press are offered by G. E. STECHERT & CO., 31 East 10th St., New York to which firm orders should be addressed

PHYSICS

Elektrische Gasentladungen. Ihre Engel-Steenbeck. Physik u. Technik. Vol. I: "Grundgesetze." 122 ill. pp. vii + 248. \$6.12.

Ergebnisse der exakten Naturwissenschaften. Ed. by the Schriftl, d. "Naturwissenschaften." Vol. XI. 158 ill. 442 pp. \$8.78.

Heering, Walther. Das Rolleiflex-Buch. 1.-4. ed. 112 pp. Ill. \$-.67.

Handbuch der Spektroskopie. Vol. Kayser-Konen. VIII. 1. 655 pp. \$16.21.

Kuhn-Freudenberg. Drehung der Polarisationsebene des Lichtes. 37 ill. 142 pp. \$3.07.

Przibram, Karl. Radioaktivitaet. 142 pp. Ill. \$-.45. Schweidler, Egon. Die Aufrechterhaltung der elektrischen Ladung der Erde. 68 pp. 111. \$1.56.

MATHEMATICS

Bieberbach, Ludwig. Differentialgeometrie. pp. vi + 140.

Bochner, Salomon. Vorlesungen ueber Fouriersche In-

tegrale. pp. viii + 227. \$3.84. Federhofer, Karl. Graphische Kinematik u. Kinetostatik. Ill. pp. vi + 112. \$3.24.

Fraenkel, K. H. & Freund, H. Lehrbuch des Zeitstudiums. Ill. 262 pp. \$3.36.

Hilbert, D. & Cohen-Vossen, St. Anschauliche Geometrie.

330 ill. pp. viii + 310. \$6.19. Menger, Karl. Kurventheorie. Ed. by Georg Noebeling. pp. vi + 374. \$5.76.

The Mishnat ha middor, the first Hebrew geometry of about 150 C. E. and the geometry of Muhammad ibn Musa al-Khowariszmin, the first Arabic Geometry (c. 820) representing the Arabic version of the Mishnat ha middot. A new ed. of the Hebrew and Arabic texts with introduction, transl. and notes. by S. Gandz. Ill. pp. viii + 96. \$5.76.

Mueller, W. Einfuehrung in die Theorie der zaehen Fluessigkeiten. Ill. 362 pp. \$4.48.
Osgood, William. Lehrbuch der Funktionentheorie. Vol.

II. 2. Ill. pp. iv + 377. \$5.28. Popoff, Kryill. Das Hauptproblem der aeusseren Ballastik im Lichte der modernen Mathematik. Ill. pp. xi+

214. \$4.32. Pringsheim, Alfred. Vorlesungen ueber Zahlen- und Funktionenlehre. Vol. II. 2: "Eindeutige analyt. Funk-

tionen." pp. viii + 600. \$8.16. Schreier-Sperner. Vorlesungen ueber Matrizen. 133 pp.

Thomas, Herbert. Die langperiodischen Veraenderlichen. Ill. 92 pp. \$1.44.

CHEMISTRY & CHEM. TECHNOLOGY

Altpeter, Julius. Die Patentliteratur d. Eiweisstoffe. (6 Lfgn.) Lfg. 1 & 2. 80 pp. 96 pp. @ \$2.04. 24 ill. Clusius, Klaus. Kettenreaktionen. (Fortschr. d. Chemie, Vol. 21 H. 5) \$3.07. Eggert, Johann. Filmgebilde aus Viskose. 134 ill. 38

plates. pp. x+300. \$6.12.

Gmelin-Kroenert. Kontroll u. Reguliereinrichtungen. Allgemeines u. Gemeinsames. (Chemie-Ingenieur, ed. Eucken-Jakob-Haber, Vol. II. 1) III. pp. ix + 208. \$4.46. Gmelin-Krauts. Handbuch der anorganischen Chemie. 7th ed. by Friedheim & Peters. Vol. VI. 2; "Seltene Erdelemente im Einzelnen.'' pp. lii + 761. \$14.64.

Jacob-Gmelin-Kroenert. Kontroll- und Reguliereinricht-

ungen. (Der Chemie-Ingenieur II) 208 pp. \$3.71. Jantzen, Ernst. Das fraktionierte Destillieren und das fraktionierte Verteilen als Methoden zur Trennung von Stoff gemischen. Ill. 38 plates. 142 pp. \$2.40.

CHEMISTRY & CHEM. TECHNOLOGY-Continued

Jordan, Otto. Chemische Technologie der Loesungsmittel.

26 ill. pp. xiv + 322. \$6.36. Kraenzlein, Georg. Aluminiumchlorid i. d. organischen Chemie. 2nd ed. 143 pp. \$2.88.

Kremann, Robert. Anwendung physikalisch-chemischer Theorien auf technische Prozesse und Fabrikations-methoden, ed. Pestemer & Scheibel. 2nd ed. 114 ill. pp.

xii + 399. \$4.68. Lehmann, Erich. Lehrbuch der organischen Chemie fuer Studierende der Landwirtschaft, der Forstwirtschaft u. d. Gartenbaues. 18 ill. pp. viii + 302. \$3.36.
Literatur-Register der Faserstoffchemie. (Kartothek

ueber saemtl., in dt. u. auslaend. Fachzeitschriften ver-oeffentl. Abh. a. d. Gesamtgebiet d. Faserstoffchemie) Nach Dr. H. Evers (Hauptkartei) 1921-1930 (mit Nachtr. 1 (1931) u. Nachtr. 2 (1932, 1. Halbj.) 7000 Kt. im Format 6 x 8 cm. In 1 Kartei-Kasten mit Stuelpdeckel. \$24.00. Robinson, Robert. Versuch einer Elektrodentheorie or

Robinson, Robert. Versuch einer Etektrodentheorie organischchemischer Reaktionen. 76 pp. \$1.44.

Roth, Walter. Thermochemie. Ill. 101 pp. \$-.45.

Runge, Franz. Organometallverbindungen, Tl. 1: "Organomagnesiumverbindungen, pp. ix + 328. \$6.24.

Thilo, Erich. Die Valenz der Metalle Fe Co Ni Cu und ihre Verbindungen mit Dioximen. Ill. 71 pp. \$1.54.

Veroeffentlichungen aus dem Kaiser Wilhelm-Institut fuer Silikatforschung in Berlin-Dahlem. Ed. by Wilhelm Eitel. Vol. 5. 117 ill. 212 pp. \$6.72.

GEOLOGY & GEOGRAPHY

Angel-Scharizer. Grundriss der Mineralparagenese. pp. xii + 293. \$4.75.

Bonne, Alfred. Palaestina. Land und Wirtschaft. 287

pp. Ill. \$3.84. Bruening, Kurt. Asien. Ill. 276 pp. (Harms, Erdkunde i. entwick. anschaulicher Darstellung) \$3.65. Curry, Manfred. Flug und Wolken, ed. Mittelholzer. 100

plates. 114 pp. \$2.88. Ehm, Ferdinand. Ergebnisse auf d. Feuerberg Aetna. 4th ed. 121 pp. \$-.70.

Geisler-Behrmann-v. Drygalski. Australien und Ozeanien in Natur-Kultur und Wirtschaft. Antarktis. Ill. 364 pp.

pp. \$8.33. Hettner, Alfred. Grundzuege der Laenderkunde. Vol. I: "Europa." 5th ed. 257 ill. pp. xi-383. \$3.36.
Leibrock, Otto. Deutschland im weltpolitischen Ge-

schehen. 435 pp. \$3.00.

Loederer, Richard. Wudu-Feuer auf Haiti. Eine abenteurel. Kuenstlerfahrt in d. tropische Wunderwelt Zentral-

amerikas. 51 ill. 216 pp. \$1.80. Maull, Otto. Sued-Amerika in Natur, Kultur u. Wirtschaft. 23 plates. 1 chart. 518 pp. Ill. \$11.52. Maull, Otto. Geographie der Kulturlandschaft. 9 charts.

ti

01

fr

th

m

eċ

141 pp. \$-.45.

Maull, Otto. Anthropogeographie. 11 charts. 136 pp.

\$-.45. Onno, Max. Geographisch-morphologische Studien ueber

Aster alpinus L. und verwandte Arten. Various plates and charts. pp. viii-83. \$9.12. Opitz, Rudolf. Bilder aus der Erdgeschichte des Nahe-

Hunsrueck-Landes Birkenfeld. Ill. 223 pp. \$3.84.

Pfalz, Richard. Morphologie des toskanisch-umbrischen Apennin. Ill. pp. vi-121. \$1.68.

Prittwitz & Gaffron. Die Oberflaechengestalt der Gebirgs-

landschaft Utschungwe im oestlichen Mittelafrika u. ihret Nachbarlandschaften Uhehe, Sued-Ussagara, Ost-Fuagi, Utemekwira. 1 Uebersichtsskizze; 1 Kt. u. 2 versch. Ausfuehrgn. nebst Deckpause; 47 Landschaftsbildern; 25 pp.

Announcing A SHORT COURSE IN TRIGONOMETRY

By James G. Hardy

Professor of Mathematics in Williams College

THIS new text is the result of over thirty years of classroom experience and has been used in preliminary form during the last three years with great success. You will find it unusually well thought out and teachable. It is not a text for memorization—but rather for intelligent study. The student is encouraged to see the reason of the topics and their sequences; he is taught to rely on his knowledge and understanding rather than his memory.

The text differs significantly from the usual treatment in that the numerical solution of triangles by logarithmic methods, or indeed by any method, has been relegated from the customary first place in importance to a secondary position.

The author's object has been to explain the nature of the trigonometric functions and many of their interesting uses; this object has determined the emphasis and proportions of the book.

Numerous and varied exercises have been included. Some of them make no demand on algebraic skill but were designed to develop insight and a real understanding. Others illustrate interesting applications of trigonometry to different fields or provide facility in the use of trigonometric relations. Continuous review is planned. A complete chapter on logarithms is included, and the results of logarithmic computation are given as worked from four- and five-place tables. Where desired the text may be purchased bound with the Macmillan Logarithmic and Trigonometric Tables, edited by E. R. Hedrick.

Published December 6

THE MACMILLAN COMPANY

60 Fifth Avenue

New York

BOSTON UNIVERSITY SCHOOL OF MEDICINE

ORGANIZED IN 1873

ANNOUNCEMENT

may be obtained by application to

THE REGISTRAR

80 East Concord Street

Boston

Massachusetts

THE WISTAR INSTITUTE BIBLIOGRAPHIC SERVICE

ISSUES

AUTHORS' ABSTRACTS

of all papers appearing in the journals listed below prior to publication of the articles in full. By this advance information biologists may familiarize themselves with contemporary research in a minimum of time.

Advance Abstract Sheets are issued twice a month, each sheet containing ten or more authors' abstracts. Subscription rate is \$3.00 per year.

Subscription rate is \$3.00 per year.

Bibliographic Service Cards, following the Advance Abstract Sheets, also are issued twice a month. In addition to the authors' abstracts, the cards provide subject headings and complete bibliographic reference. The cards are convenient for filing and library records. Price, \$5.00 per year.

At regular intervals the authors' abstracts are assembled and published in book form with complete authors' and analytical subject indices. Price, \$5.00 per volume. Liberal discount to subscribers to the Bibliographic Service Cards,

JOURNAL OF MORPHOLOGY
THE JOURNAL OF COMPARATIVE NEUROLOGY
THE AMERICAN JOURNAL OF ANATOMY
THE ANATOMICAL RECORD
THE JOURNAL OF EXPERIMENTAL ZOÖLOGY
AMERICAN ANATOMICAL MEMOIRS
AMERICAN JOURNAL OF PHYSICAL ANTHROPOLOGY
JOURNAL OF CELLULAR AND COMPARATIVE PHYSIOLOGY
FOLIA ANATOMICA JAPONICA (Tokyo, Japan)
PHYSIOLOGICAL ZOÖLOGY (Chicago, Illinois)
STAIN TECHNOLOGY (Geneva, New York)
ECOLOGICAL MONOGRAPHS (Durham, North Carolina)

The Wistar Institute of Anatomy and Biology

SCIENCE NEWS

Science Service, Washington, D. C.

MEETING OF PHYSICISTS AT CHICAGO

By WATSON DAVIS

WHY cosmic rays bombard the earth less energetically near the equator, as Dr. Arthur H. Compton's worldwide survey discovered, was given theoretical explanation by the Abbé Georges Lemaitre, University of Louvain priest-cosmologist, in a paper before the American Physical Society meeting at the University of Chicago. Using the idea that cosmic rays are affected by the magnetism of the earth just as electrons from the sun cause the aurora in polar regions where magnetism is strong, Professor Lemaitre has evolved a mathematical theory that shows that electrons of ten thousand million volts can not reach the earth's surface at the equator. The great earth-magnet pulls the electrified particles into streams over the two ends of the earth. Professor M. S. Vallarta, of Massachusetts Institute of Technology, collaborated in this theory with Professor Lemaitre. After coming to America for the eclipse, Professor Lemaitre has worked in Cambridge, Massachusetts. He is now going to visit the Mount Wilson Observatory and the California Institute of Technology. There he will probably see Einstein, who arrives about New Year's Day. The idea of the expanding universe originated with Professor Lemaitre and last year he suggested the following theory: Ten thousand billion years ago, more or less, the universe was a gigantic atom weighing as much as all the matter in the universe. That primordial atom exploded, shooting out powerful rays, as uranium and radium disintegrate to-day. These rays have traveled through space ever since and now rain on the earth as cosmic rays. He considers that this theory is upheld by the Compton experiments and his newer theory. Instead of being mere electrons or even heavier helium particles, Professor Lemaitre further suggested that the cosmic rays may be the hearts of weightier atoms, such as oxygen and iron, let loose in the original atomic and universal super-radioactivity.

STREAMS of electrons, the ultimate particles of electricity, when shot through crystals promise to reveal some of the secrets of the heart of matter, the atomic nucleus, according to a report made by Drs. K. Lark-Horovitz and H. J. Yearian, of Purdue University, to the American Physical Society. They have found unmistakable evidence of the rôle that the nucleus of the atom plays in the diffraction of electrons by crystals. Whereas the x-ray method of crystal pattern study shows only the behavior of the electron cloud around and outside the heart of the atom, the electron waves are strongly influenced by the charge of the nucleus of the atom itself. This effect showed in the Purdue experiments as a difference in the intensity distribution of the scattered electron waves as compared with the x-ray pattern. German physicist, Dr. M. von Laue, first discovered that x-rays could reveal atomic structure. He was given the Nobel prize for this research. The x-rays are so much

shorter in wave-length than visible light that they are scattered by the atoms that make up matter. Photographs of x-rays passed through crystals allowed physicists to work out the way atoms arrange themselves in matter and in part how they put themselves together. The discovery that electrons themselves have some of the properties of light and x-rays and can be diffracted was made by two American physicists, Dr. C. J. Davisson and Dr. L. H. Germer.

A NEW instrument for measuring gravity so sensitive that it detects the attraction of the moon was explained to members of the society by its inventor, Dr. Kenneth Hartley, of Houston, Texas. Measurement of gravity to within two or three parts in a million, which corresponds to two or three feet of difference in elevation, is of value in prospecting for oil and valuable minerals. Dr. Hartley made his gravity balance with that end in view, but it has proved to be so sensitive that it has an accuracy ten times that of the pendulum apparatus of the Coast and Geodetic Survey with which official gravity values are determined. The attraction of the moon registered on the Hartley balance agreed with the vertical part of the moon's pull upon the instrument as computed theoretically. Making readings each hour during a complete cycle of the moon's journey around the earth, which takes a little less than a month, Dr. Hartley found that the moon's attraction has a period of 24.8 hours and that the 12.4 hours' period found in the tides is not present. Another puzzling discovery was a small lag in time of the recorded values as compared with those mathematically expected. This has not been explained. The Hartley gravity instrument uses the elasticity of a spring in measuring gravity. The only previous successful methods have used some form of pendulum for determining the acceleration produced by gravity. With the type of pendulum apparatus used by the government engineers, gravity can be accurately determined in only three or four places in a month, while Dr. Hartley claims that he can ascertain gravity at three places within an hour if the weather is reasonably good.

VAMPIRE BATS AND PANAMA HORSE DISEASE

MURRINA, or trypanosomiasis, a fatal disease of horses in Panama and northern South America, is transmitted from infected cattle to healthy horses by the vampire bat.

This is the second known instance of a disease being carried by a mammal. Discovery of the bat's rôle in the spread of the disease was made at the Panama laboratories of the Gorgas Memorial Institute and reported by the director, Dr. H. C. Clark, at the meeting of the board of directors in Washington.

The only other mammalian vector of disease so far known is the dog, which transmits rabies. Certain other mammals, such as rats, play an important part in the spread of diseases, but the actual transmission of the germs is by insects.

Dr. Clark and associates had been investigating flies, fleas and many other insects in their more than 20-year search for the vector or carrier of this disease. Having ruled out insects, they sought for the only blood-feeder left that commonly attacked horses, mules and cattle, the vampire bat, although it seemed like medical heresy to suspect this mammal.

Yet they have now established the fact that these animals can acquire the disease by feeding on a horse, mule or laboratory animal infected with the disease and that they live about one month after acquiring it. During this time their appetite is unaffected, so that there is ample time for them to pass the disease on to uninfected animals on whom they may feed. The germ of the disease incubates for about ten days in the body of the vampire bat. It then gets into the saliva and so is readily transferred to the next animal the bat feeds on. This is particularly favored by the bat's feeding habits.

This bat does not actually suck blood but licks it up with its tongue, Dr. Clark pointed out. When the bat feeds from below the wound or on a wound from which the blood is flowing freely, it does not lick, since it gets enough blood without. In such cases, the bat does not infect the animal on which it feeds. Ordinarily, however, the vampire bat makes a stab-like incision with its sharp upper tooth, much as a surgeon would with a blood-letting instrument. Then the bat will lick the wound for an hour or two until it is satiated.

Cattle in Panama are the chief reservoir of the disease. They may be infected with the germs of trypanosomiasis without becoming ill. Horses and mules commonly graze with cattle in Panama. These may be protected from the disease if they are stabled in barns, instead of being allowed to range with cattle at night, and if the barns are screened or well lighted by electric bulbs or clean lanterns. These measures will prevent bat attacks.

Unlike trypanosomiasis in Africa, which is fatal sleeping sickness, the disease in Panama and Central America does not attack people, but is limited to animals. Both he and his laboratory assistant were accidentally infected when a syringe containing the causative organisms broke in their hands, yet neither of them acquired the disease.

True vampire bats are very difficult to obtain for study. Prior to January, 1932, only ten, both living and dead, had ever been obtained. During the present year thirty-two of them have been caught unharmed. They roost in caves, and are quite small, about the size of mice. They will apparently feed on anything that has blood, and have even been known to feed on the web between the toes of a pelican, when they can catch the bird asleep. When they bite people it is only on the fingers and toes.

Horses afflicted with the disease can now be treated by injecting certain chemicals into the jugular vein. This modern method of treatment has been fairly successful. Dr. Clark expects to report further on the results of the method at a later date.

SEX CONTROL

PROSPECTIVE parents will some day be able to settle in advance whether the baby they are inviting into the world is to be a boy or a girl. This prophecy was made by Dr. Richard Goldschmidt, director of the Kaiser-Wilhelm Institute for Biology in Berlin, who is at present at the California Institute of Technology. Professor Thomas Hunt Morgan, president of the institute, introduced Dr. Goldschmidt as a leading authority on the subject of sex control.

Dr. Goldschmidt stated that he believes a technique will eventually be discovered to control the sex of children. He also believes this will not alter the present sociological situation, which is based on the approximate numerical equality of the sexes.

The problem is simple in principle, Dr. Goldschmidt said. It depends on the fact that the male sex cells in man are of two kinds. One half of all the male sex cells carry the so-called sex chromosome, the other half are without it. If the female sex cell, or ovum, is fertilized by a male sex cell carrying the sex chromosome, the child which develops from this union will be a girl. If the fertilizing male cell does not carry the sex chromosome, the child will be a boy. The problem of controlling the sex of future children therefore becomes a problem of encouraging one kind of male sex cell and of discouraging the other kind.

Since male sex cells are produced in batches of hundreds of thousands, with both kinds mixed together, the problem will be no easy one to solve. No method now exists to determine in advance the sex of human children, and none is in immediate prospect; nevertheless Dr. Goldschmidt is hopeful that eventually a method will be found.

The presence or absence of a sex chromosome in the male sex cell determines the sex of the resultant individual if developmental conditions are normal and are not interfered with. But the determination is not an absolutely rigid matter. Chemical upsets in the environment of the developing embryo during its earlier stages can cause the production of "intersexed" individuals, or even reverse sex altogether, making females of what would normally have become males and vice versa. This chemical reversal of sex in already-started individuals has been accomplished many times with lower organisms. Conceivably it might some day be worked on human beings as well.

THE IMPORTANCE OF VOLCANOLOGY

A RECENT address by Dr. E. G. Zies, of the geophysical laboratory of the Carnegie Institution of Washington, on volcanology, ranged through various practical fields to such problems in "pure" science as the study of the orientation of the magnetic field of lava flow. There is some evidence, Dr. Zies said, quoting his associate, J. A. Fleming, that the local magnetic field of a lava flow is determined in its polarity or direction by the condition of the earth's general magnetization at the time the lava was erupted. If this preliminary evidence is substan-

A ti hea P

T

tiated by later work, it may some day be possible to date lava flows from the known state of the earth's magnetic field in the past.

The chief practical point in the study of volcanology, however, is the hope it gives of eventually working out a method for the prediction of eruptions. We are still far from this, Dr. Zies stated, but enough has been done to justify a hope that it can yet be accomplished. When predictions are undertaken, they must be reliable, for the unnecessary terror caused by the prediction of an eruption that fails to come off would be second in evil only to failure to predict one that does happen.

The working out of a practical prediction method will depend entirely on amassing continuous and connected data over a long period of years, Dr. Zies pointed out. This will have to be done, not by short-lived expeditions to the neighborhood of some spectacularly active volcano, but by settling down in the neighborhood of an active volcanic field with a staff of competent scientists and carrying on the work as a regular laboratory project.

According to Dr. Zies, Central America offers at our own back door the best imaginable field for such an intensive study of volcanoes in all phases of their activity. It contains the greatest concentration of volcanoes, both active and long-extinct, in all the world. Among the active craters is the famous Izalco, the most active volcano known; it erupts every half hour, and about every two years sends forth a lava flow. Contrasted with this are volcanoes so long extinct that all traces of their craters are eroded away and deep gorges have been carved in their slopes.

His suggestion is that some agency, either an already existing scientific foundation or a cooperative group of volcanologists with a central administrative organization, go into the field with a definite program of work in view, to cover a long stretch of years. Under a scheme like this he feels that an encouraging beginning can be made toward a fuller understanding of volcanoes and the eventual ameliorating of their terrors through a foreknowledge of what they are likely to do next, and when they will probably do it.

ITEMS

PHOTOGRAPHIC records of the spectrum of a meteor, believed to be the first ever obtained, were made during the recent Leonid shower by Dr. P. H. Millman, of the Harvard College Observatory. Dr. Millman carried on his observations at the Oak Ridge station of the Harvard Observatory, and on the morning of November 16 succeeded in photographing the spectra of persistent trains of two unusually bright meteors. Examination of the bright bands in these "rainbow photographs" will tell scientists what elements were burned during their swift and brilliant flight of annihilation through the earth's upper atmosphere. In spite of the disappointingly low number of meteors, Dr. Millman and his cooperators succeeded also in obtaining direct photographs of the brighter of the two meteors, as well as simultaneous observations of both from two or more well separated stations. These will enable the astronomers to make good determinations of their heights.

A NEW atom-smashing machine, operating at a power of 4,800,000-volt electrons, has been completed at the University of California, and is ready for use in exploring hitherto unattainable corners in the field of physical research. It exceeds by 1,200,000 the previous high attainment of 3,600,000-volt electrons, announced a few weeks ago. The tests were made by Professor E. O. Lawrence, head of the university's radiation laboratory, and his associates Dr. M. Stanley Livingston and Milton G. White. The new apparatus will be used in work along the same lines that resulted in the smashing of the lithium atom by physicists at the University of Cambridge last spring. In disrupting the lithium atom, the lightest of all metallic atoms, 800,000-volt electrons were used. With the far more powerful apparatus now available, it is believed that any atom in the whole table of elements can be blasted apart.

Measuring the intensity of radium applied externally for treating cancer in the head or neck is a problem that one British hospital has attempted to solve by the use of wax models. A life-size human head has been built up in a series of sections about one third of an inch thick. Each is east in wax of very nearly the same density as the soft tissues, and superimposed on the top and bottom surface of each section is a photograph of the anatomical structures occurring there. If the actual radium applicator used on the patient is applied to the model it vill affect a photographic film inserted at any particlevel where the dosage is in question so that after velopment its relative intensity can be measured.

ARIZONA Indians ate turkey nearly a thousand ago. They also ate hawks, owls, coots and robin well as the more appetizing quail, if bones found in Arizona ruins dating between 1000 and 1100 A.D. e any criteria. The bones were found by Lyndon L. irgrave, of the Museum of Northern Arizona, and ide tified by Dr. Alden H. Miller, of the Museum of Vertebrate Zoology of the University of California. The turkeys, Dr. Alden says, could have been obtained by the Indians in the neighborhood of the San Francisco Peaks, a prominent mountain range in Arizona.

A NEW German scientific device makes possible the "micro-melting-points" of crystals. The exact determination of the melting points of various materials is of great importance not only for chemists and physicists, but for the metal trades, chemical industries and other practical applications of science. It is not always possible to determine melting points of large quantities of material, and sometimes only tiny samples can be had in any case. The new apparatus gets around these difficulties by providing a glass-covered, electrically-heated metal plate on which the sample can be placed while it is observed or photographed through a microscope, to detect the first signs of melting, in the breakdown of sharp crystal outlines and the formation of liquid droplets. The micromelting-point apparatus is described by Professor Ludwig Kofler, of the University of Innsbruck, in Forschungen und Fortschritte.

THE WISTAR INSTITUTE BIBLIOGRAPHIC SERVICE

ISSUES

AUTHORS' ABSTRACTS

of all papers appearing in the journals listed below prior to publication of the articles in full. By this advance information biologists may familiarize themselves with contemporary research in a minimum of time.

Advance Abstract Sheets are issued twice a month, each sheet containing ten or more authors' abstracts.

Subscription rate is \$3.00 per year.

Bibliographic Service Cards, following the Advance Abstract Sheets, also are issued twice a month. In addition to the authors' abstracts, the cards provide subject headings and complete bibliographic reference. The cards are convenient for filing and library records.

Price, \$5.00 per year.

At regular intervals the authors' abstracts are assembled and published in book form with complete authors' and analytical subject indices. Price, \$5.00 per volume. Liberal discount to subscribers to the Bibliographic Service Cards.

JOURNAL OF MORPHOLOGY
THE JOURNAL OF COMPARATIVE NEUROLOGY
THE AMERICAN JOURNAL OF ANATOMY
THE ANATOMICAL RECORD
THE JOURNAL OF EXPERIMENTAL ZOÖLOGY
AMERICAN ANATOMICAL MEMOIRS
AMERICAN JOURNAL OF PHYSICAL ANTHROPOLOGY
JOURNAL OF CELLULAR AND COMPARATIVE PHYSIOLOGY
FOLIA ANATOMICA JAPONICA (Tokyo, Japan)
PHYSIOLOGICAL ZOÖLOGY (Chicago, Illinois)
STAIN TECHNOLOGY (Geneva, New York)
FOLOGICAL MONOGRAPHS (Durham, North Carolina)

The Wistar Institute of Anatomy and Biology Philadelphia, Pa., U. S. A.

LEADERS IN EDUCATION

A BIOGRAPHICAL DIRECTORY

Edited by J. McKEEN CATTELL

The Biographical Directory of Leaders in Education contains biographies of over 11,000 of those in America who have done the most to advance education, whether by teaching, writing, research, or administration, a careful selection from the million educational workers of the United States. They are those to whom daily reference is made in the press, from whom all positions of importance are filled. It is a work essential to all who have relations with those engaged in educational work, necessary to every reference library.

Over 1,000 pages Over 11,000 biographies Price \$10.00

PUBLISHED BY

THE SCIENCE PRESS

GRAND CENTRAL TERMINAL, NEW YORK, N. Y.

BOSTON UNIVERSITY SCHOOL OF MEDICINE

ORGANIZED IN 1873

ANNOUNCEMENT

may be obtained by application to

THE REGISTRAR

80 East Concord Street

Boston

Massachusetts

KOSMOS

By

WILLEM DE SITTER
Director of the Observatory, Leiden, Holland

"Dr. Willem De Sitter has contributed so much to modern theories of our universe that any book from his pen must command the attention of the scientific world and of the intelligent reader who would keep in touch with the rapid expansion of astronomical concepts. This new volume is a scholarly treatment of the evolution of ideas regarding the structure of the universe, from ancient times to the present day. . . The closing chapter gives an excellent summary of the contributions of Einstein and of the author with regard to the more theoretical aspects of the properties and distribution of matter and space."-Scientific Book Club Review.

\$1.75 a copy, postpaid

Harvard University Press 51 Randall Hall, Cambridge, Mass.

SCIENCE NEWS

Science Service, Washington, D. C.

CELEBRATION IN HONOR OF DR. GUENIOT

CELEBRATING the centenary of an eminent scientific man is not unusual. The French Academy of Medicine, however, has just had the unique opportunity of celebrating the centenary of one of its living members, Dr. Alexandre Guéniot, eminent obstetrician, surgeon and author, and former president of the academy.

The distinguished audience included General Gouraud, Military Governor of Paris, the Minister of National Education, the Minister of Public Health, the chairman of the Paris Municipal Council, Madame Curie, discoverer of radium, Dr. Roux and Dr. Calmette, heads of the Pasteur Institute, and many others whose reputation is international.

Dr. Guéniot was an erect, alert figure, smiling attentively at the kindly speeches which one distinguished orator after another delivered. They all read their carefully prepared addresses. But when it came turn for Dr. Guéniot to reply, he jumped up lightly from his chair and delivered the opening sentences of his speech without any reference to his manuscript. Afterwards he sat down and read a short paper, the whimsical wit of which made this assembly of the most eminent savants of France rock with laughter.

In the course of a presentation of a medal of the town of Paris by the chairman of the Municipal Council, it was pointed out that a facsimile had been presented to a man of 117 years at the inauguration of the statue of Louis XIV in the Place des Victoires. Hippocrates had reached the age of 109, and in 1809 Napoleon had received in audience a doctor born in 1690.

The day after Alexandre Guéniot was born, his father wrote to an intimate friend:

"I do not know whether to be happy or sorry over the birth of a son to which I have contributed only a modest share. The poor infant enters the world in very troubled times. Hardly seventeen years have passed since peace was restored to Europe, and we still suffer cruelly from the effects of the war. Who knows if my son will not one day be forced to become the citizen of a republic? It makes one shudder. The conditions of life are daily becoming more difficult. Nanette, our servant, has paid 23 sous for half a kilo of butter, and 2 sous for each fresh egg! It is absurd and exorbitant!

"I should like to see my son embracing the noble career of medicine, but I see quite well that he can not; one of the heads of the faculty has confided to me that this profession is literally invaded. And then, this madness of speed is wearing out men. Only yesterday I saw a post chaise tearing along. It makes one giddy! The horses were galloping at more than 5 leagues an hour. And every one wants his carriage! The streets of Paris are so congested that you must wait a long time if you wish to cross them. Madness of the century, my dear friend, for which men will pay in the brevity of their days.

"My son, like his contemporaries, will not live to be

old. We know not what the future has in store for him, but we can bet with certainty on his not becoming a centenarian."

THE CONSERVATION OF ENERGY

THE law of conservation of energy which has been the cornerstone of physical theories for several generations may have to be discarded when dealing with certain atomic transformations. The conservation of energy is now doubted because identical radioactive atoms give off electrons of different energy and apparently continue to be identical so far as their energy is concerned.

Dr. Niels Bohr, the Danish physicist, was the first who expressed doubts concerning the validity of the principle of conservation of energy in subatomic phenomena.

At the recent meeting of the British Association in York and again at a physicists' conference in Leningrad, leading investigators discussed this momentous question.

"If we ignore the limitations placed upon us by the unnecessary conservation law, we are led to very interesting developments not only in the case of nuclear phenomena, but also when dealing with the origin of solar energy," Dr. G. Gamow, a young Russian physicist of the Physical Institute of the Academy of Sciences of Leningrad, said in an interview.

"The heart of a star," continued Dr. Gamow, "may be likened to one large atomic nucleus, a few inches or a few miles in diameter. Like the nucleus of the atom this central portion of the star can give off energy continuously, without thereby having its own store of energy or matter reduced. At the same time the star's central core by breaking up into particles of different size gives rise to the nuclei of all known elements. I am at present engaged in calculating upon a probability basis the relative abundance of the different elements originating in the central portion of the star. The final proportion of elements which should be present in a star depends upon other factors as well, for instance upon the lesser stability of the nuclei of the lighter elements under the bombardment of high velocity protons."

THE AGE OF RIVERS AND THE MOUNTAINS THEY FLOW THROUGH

RIVERS are often older than the mountains that rise about them, older than the seemingly impassable ridges through which they flow in steep-sided canyons and "water gaps." How this apparent paradox is geologically possible was explained by Professor Douglas Wilson Johnson, of Columbia University, in a lecture at Washington before the Society of Sigma Xi.

ti

ti

li

in

Professor Johnson chose as examples the rivers of the eastern seaboard of the United States, such as the Potomac and the Susquehanna, which rise "back of the mountains," yet break through them to the sea. The rivers, he said, were there before the mountains. Many ages ago, when the predecessors of the present Appalachian mountain system had been weathered away until there remained only a nearly level plain sloping gently.

to the sea, the rivers flowed from west to east naturally and with but little hindrance, just as they flow through the prairies of the West to-day.

Then a slow upheaval along the mountain axis lines began. This increased the "pitch" of the land, causing the rivers to flow faster and to wear deeper channels. The more the land rose, the deeper the river cuts became, and the rivers managed to keep their beds cut down to a level that still permitted their egress to the Atlantic, though in places the "water gaps" they had formed became such spectacularly deep affairs as travelers now see at Harper's Ferry on the Potomac.

As the mountain ridges rose, the rivers developed tributaries that ran parallel with them. In time they wore the softer rocks into deep valleys, like the present Shenandoah Valley, leaving the harder rocks standing up as long mountain ridges. In places one of these tributaries worked along the valley so far that it encroached upon the next cross-flowing main stream, and actually "decapitated" it, stealing its upper end and annexing it to its own river system. The North Branch of the Susquehanna is such a pirated stream; it once belonged to the Delaware, but was stolen by the Susquehanna tributary that worked northward along a mountain valley.

PREVALENCE OF RICKETS

THE American Medical Association finds that rickets is still far too prevalent in many communities. This serious childhood disease continues in spite of the fact that a means of preventing it is known and has been broadcast for years by welfare organizations and advertisers of curative and preventive products.

Rickets is caused by lack of an essential diet factor, vitamin D. This is found in various natural products, notably cod-liver oil, and is formed in the body when the skin is exposed to ultra-violet light from the sun or certain other light sources. When these facts were discovered, it was expected that rickets would be eliminated as a serious health menace, just as scurvy was when the cause of that disease was discovered to be lack of vitamin C and the scurvy-preventing foods that contained the vitamin were recognized.

Commenting on rickets, the American Medical Association states that the situation is frankly disappointing. Besides cod-liver oil and cod-liver oil concentrates, the association calls attention to such other available antirachitic agents as viosterol, which is irradiated ergosterol, irradiated products of various kinds, foods fortified with viosterol, and direct ultra-violet irradiation.

Efforts to give rickets-preventing properties to two such widely used foods as milk and bread are of particular interest, in the opinion of the medical association. One of the most recent developments along this line is the successful irradiation of liquid milk at almost insignificant cost, which is reported by Dr. A. F. Hess and J. M. Lewis, of New York City. By means of carbon are rays, these investigators were able to give milk antirachitic potency which was retained when the milk was dried.

Milk is particularly suitable for such irradiation and subsequent use in preventing rickets because it contains

so much calcium and phosphorus, both important in treatment or prevention of rickets.

In the opinion of Drs. Hess and Lewis the use of irradiated liquid milk will probably be restricted to cities.

THE DANGERS FROM DUST

INSTEAD of being a health menace, coal dust breathed in by miners along with rock dust may be a positive benefit, Professor J. B. S. Haldane, of the University of Cambridge, told a University of Michigan audience in a lecture on "Bad Air."

The secret is that coal dust seems to stimulate the expectorant activities of the lungs and throat, so that this dust is eventually removed from the lungs. Rock dust has no such action and normally would remain, a health hazard in the lungs, but when coal dust is mixed with it, the rock particles adhere to the coal and are largely removed from the body when the latter is coughed up.

In the mining sections of the Rand, in South Africa, workers in the quartz seam gold mines are being given transfers of several months to the coal mines as a practical test of this finding, Professor Haldane stated.

Of all working conditions, bad air of one sort or another is the greatest, but most insidious killer, far exceeding industrial accidents in its final totals. Flyers, who at high altitudes get not impure air, but too little, should be warned that the symptoms of this condition are high spirits and optimism which may lead to continued exposure or foolhardy feats.

British statistics, kept on a national scale, indicate that workers in rades exposed to mineral and metallic dust, cutlery grinding being an especially bad example, are much more liable than the average man to tuberculosis, pneumonia and edema of the lungs. Limestone and igneous rock workers, and flour mill employees do not seem to suffer ill effects, but employees in dust-filled cotton mills and sand blasters do, Professor Haldane stated. Silica dust is always dangerous.

Every employer of labor where dust or dangerous gases are an occupational risk, should take steps to remedy the condition. The worker who is being protected is usually the hardest factor to deal with. Employees can easily be urged to protect themselves against machinery that may cause their death in an hour's time, but become careless with dust that may mean death in five years. Employers also benefit from protective measures. In England, he said, one of the reasons why the tin mines have been abandoned was the high compensation rates the operators had to pay workers injured under bad conditions.

DISTRIBUTION OF GAME ANIMALS

So effective has been the conservation of game animals by the government that it is now possible to distribute a surplus quantity of buffalo, elk, and mule deer for exhibition and breeding purposes, and some buffalo and elk are even available to be used as meat.

The two agencies of the federal government engaged in this distribution are the National Park Service of the

Department of the Interior and the Bureau of Biological Survey of the Department of Agriculture. Different methods of distribution are pursued by these two bureaus.

The National Park Service, which disposes only of surplus buffalo and elk, from Yellowstone National Park, has authority to give a limited number of these animals to municipal zoos and other public institutions and to individuals who can give assurance that they have facilities available for properly caring for the animals. No charge is made for them, but in each case the recipient is required to pay all expenses incident to their capture, crating and delivery. In addition to furnishing animals for exhibition purposes, after this demand is met, under special congressional legislation, the killing of any remaining surplus buffalo from the Yellowstone herd for use as meat is permitted, in order that the herd may be kept down to a total of 1,000 head, the maximum number which the range will support.

The Bureau of Biological Survey, on the other hand, has a problem of disposing of surplus buffalo, elk and mule deer, in order to prevent over-grazing on its biggame preserves. This year the bureau has called for bids on 141 buffalo, 162 elk and 45 mule deer. sales already have been made and it is believed that most of the animals will be sold, but by making special arrangements, a state or municipal park or zoo may obtain a few animals at cost of handling and transportation. Surplus buffalo and elk that can not be disposed of in this way will be sold for meat, although animals less than two years of age will be sold only for breeding and exhibition. The mule deer, which are suitable only for regions west of the Mississippi R er, will be disposed of only for exhibition and breeding. It is necessary to maintain a certain limit on the numbers of these animals that may be grazed on the various game preserves, in order to avoid over-grazing and resultant malnutrition and suffering among the animals under govern-

The National Park Service states that the shipping weight of buffalo, crated, varies from 850 pounds for yearlings to 2,000 pounds for four-year-olds and over. The shipping weight for adult elks, crated, varies from 600 to 800 pounds.

In previous years the surplus Yellowstone buffalo to be used for meat were sold to the highest bidder, but recently the demand for this meat has decreased and it was therefore suggested that the best use that could be made of the meat was to offer it to the Indian tribes in the vicinity and to the relief organizations of adjoining states.

ITEMS

THE amount of influenza in the country almost doubled within a week, according to reports received from state health officers by the U. S. Public Health Service. A sharp outbreak on the West Coast has now spread to the South. For the country as a whole, 6,306 cases were reported for the week ending November 26, the last for which complete figures are available. For the preceding

week the total was 3,086. Influenza reporting is said to be notoriously poor, and health officials estimate that the actual number of cases is probably five or six times the reported number. The states having the largest number of cases are Alabama with 1,940, Arizona with 479, Louisiana with 600 and California with 1,721.

SAN José scale, one of the worst insect pests of orchard trees in America, has been discovered in several recently planted orchards in Austria. It was traced to a source in Hungary; the insects were on young trees from nurseries in that country. All such nursery stock is supposed to be fumigated with cyanogen gas, but apparently in some instances at least due care was not exercised. All the affected trees in Austria have been destroyed, and the orchards where they grew are under strict quarantine. Hungarian authorities are taking steps to wipe out the focus of infestation in their country, and German agricultural and customs officials have redoubled their guard against the pest in nursery stock crossing their boundary.

GASEOUS ammonia has been detected in the atmosphere of the planet Jupiter, by Dr. R. Wildt, of the astronomical observatory of the University of Göttingen. Dr. Wildt made his discovery through a study of the infra-red spectrum of the planet's light. He has also found methane, or marsh-gas, in the atmosphere of Jupiter, Uranus, Saturn and Neptune.

IRREGULARITIES of the teeth are to be the subject of special research at Columbia University. This condition is scientifically known as malocclusion. A common form is seen in people with buck teeth. Malocclusion is found in all races and at all levels of society. Confusing theories as to its cause and results are held by both dentists and physicians, and even the present methods of treatment are unsatisfactory. Investigation of the subject at Columbia will be under the direction of Dr. Milo B. Hellman who has been appointed professor of dentistry at the university.

Asking a child which parent he prefers, or even questioning the parent in this regard, is no way in which to test the theory of Freud that children tend to prefer the parent of the opposite sex, Dr. Dorian Feigenbaum, psychoanalyst of New York, said in a letter to Science Service. Freudians have never maintained that parents, or even the children themselves, are conscious of a specific preference for the parent of the opposite sex. When speaking of such a preference, Freudians refer to drives and complex situations far removed from consciousness and detectable only by analysis. These comments referred to a study recently conducted by Dr. John E. Anderson, of the University of Minnesota, in which questionnaires were filled out by the parents of 3,178 children. The answers indicated no sex differences in attachment for the parents-both boys and girls showing a slight tendency to prefer the mother.

Where Gates: Elementary Psychology is the class text, study will be facilitated if students are equipped with

Brown's WORKBOOK IN ELEMENTARY PSYCHOLOGY

Especially prepared by A. E. Brown, Associate Professor of Education in Iowa State Teachers College, for the day-by-day study of Arthur I. Gates' popular textbook.

THIS WORKBOOK, containing forty-one lessons and four reviews, furnishes assignments to the Gates text and references to various accessory works, directions for study, notes on the assignment context, additional material which throws the light of the very latest research on the topics under consideration, and enough exercises on each assignment to drive home every significant point.

Each unit a day's work

Rather than covering large blocks of material as is often done in workbooks, this study guide has been carefully laid out in units corresponding to the work a student should accomplish from one class to the next. Each chapter in the Gates text is the basis of from one to three of these units. Instructors will appreciate this clear-cut organization, which simplifies the assignment problem notably, and, if properly utilized, assures the assimilation of each day's lesson before the next is begun.

Tested

This workbook is not a collection of untried material. Carefully tested in a controlled experiment at the author's institution it was found to assist students to a definitely superior performance. It is now offered to the wide and growing group of classes where the Gates text is in use, in hopes that it will aid students everywhere toward the complete assimilation of this excellent work.

The WORKBOOK, \$1.25

Diversified Exercises

Usually as many as forty exercises are given on each assignment, and the review exercises, which are introduced at suitable points to provide a larger view and to maintain proper connections, contain even more. Many types of exercises are employed throughout the workbook—at least four different types for each lesson, selected to present the material in its most appropriate and effective form. Among the types used are: Yes-No Questions, Completion Exercises, Matching Exercises, Picking out the Misfitting Term, Questions for Written Exposition or Interpretation, Analogies, Incomplete Outlines, Sentence Answers, etc.

Convenient Format

The workbook contains 182 pages, perforated for ready detachment, and punched for insertion in a ringed note book cover. It is bound in heavy gray paper.

Gates: ELEMENTARY PSYCHOLOGY, \$2.60

THE MACMILLAN COMPANY

60 Fifth Avenue, New York City

SCIENCE NEWS

Science Service, Washington, D. C.

DECREASE IN PELLAGRA

DEATHS from pellagra, "hard times" disease, have unexpectedly decreased during the present depression. Vegetable gardens and yeast seem to have effectually routed the former specter of economic depressions.

These two factors, together with education in pellagrapreventive measures, seem to have reduced the pellagra death rate by about one third in the face of the country's worst depression, according to a discussion of the subject by Dr. William DeKleine, of the American Red Cross, at a meeting of the Florida Public Health Association.

Dr. Joseph Goldberger, of the U. S. Public Health Service, showed before his death that pellagra is caused by lack of a certain factor in the diet. This factor is now called vitamin G. It is found in fresh vegetables, lean meat and abundantly in dried yeast.

When the great flood of 1927 devastated large portions of the Mississippi Valley, the American Red Cross undertook to apply Dr. Goldberger's findings. Dried yeast was distributed on a large scale. The residents of the area were encouraged to start home vegetable gardens, and more than 120,000 packages of seeds were distributed in 1927 and 1928. This action reintroduced gardening in many sections of the flood area where the farmers had previously depended on a cash crop, buying their own food at the stores and commissaries. Under this system, when the cash crop failed, they were unable to buy adequate food and, having raised none themselves, fell victims to the hard-times disease, pellagra.

The introduction of gardening in the flood areas was continued in other Southern states until 1932. In addition, housewives were shown how to can and preserve the garden foods for winter use. Dr. DeKleine believes that it is this gardening and canning, in addition to the distribution of yeast and other health foods by the Red Cross and other relief agencies, which have caused the drop in pellagra deaths despite the depression.

THE CAUSE OF DENTAL DECAY

LACK of phosphorus and vitamin D in the diet is the chief cause of dental decay, Dr. R. Gordon Agnew, of West China Union University, reported to the Board of Governors of the university meeting on December 6. Dr. Agnew's report summarized his four years of research in which he analyzed three thousand diets.

Depriving animals of these two food elements produced tooth decay in almost one hundred per cent. of the cases. Experience with the diet of four hundred and fifty children of a Toronto institution bore out the results of Dr. Agnew's studies on animals.

Dr. Agnew stated that his extensive experiments on laboratory animals and humans indicate that phosphorus and vitamin D are the important nutrient elements in the prevention of dental caries. With the laboratory animal phosphorus assumes a major rôle, but in humans, vitamin D becomes of great importance.

Dr. Agnew's findings check with observations made in the laboratories of Dr. E. V. McCollum, of the Johns Hopkins University. Dr. McCollum and his associates found that definite proportions of vitamin D, phosphorus and calcium were needed in the diet in order to prevent tooth decay. They explained this on the theory that the phosphorus was needed in the saliva to enable this secretion to act as a buffer solution keeping enamel-destroying acid from accumulating. Without the proper amounts of calcium and vitamin D, however, they believed the phosphorus would not get into the blood and then the saliva.

Commenting on Dr. Agnew's work, Dr. McCollum called it one of the more important chapters in the history of nutritional research.

"The inference drawn from the research," he stated, "shows that if we get an adequate supply of vitamin D, plenty of milk, vegetables and other foods rich in phosphorus, we can nearly all prevent dental caries. In that event attendant diseases attributed to caries will be materially lessened.

"It so happens that the average American diet is built around the protective foods rich in phosphorus and calcium. With a little care we can obtain the elements necessary to nutritional well-being, with the exception of vitamin D which is found chiefly in fish oils. Its natural source is found in the skin when activated by the ultra-violet rays of the sun. Unfortunately, the sun in this latitude is seldom strong enough, so the natural source must be supplemented."

SUN-SPOT CYCLES

SUN-spots do not always grow more numerous at eleven-year intervals. There have also occurred periods in which the sun has very few spots at all and during these "dearth" periods the low numbers that do show themselves probably reach their maxima at intervals of ten years instead of the usual eleven.

This was one of the points developed in a lecture at the Carnegie Institution by Dr. A. E. Douglass, astronomer at the University of Arizona. Dr. Douglass has done notable research on climatic cycles as revealed by the varying widths of growth-rings in trees, and by using these data in the examination of wooden beams he has been able to determine when Indian pueblos in the Southwest were built.

The most notable period of sun-spot dearth since the beginning of modern astronomy, the speaker said, occurred in the seventeenth and eighteenth centuries. During this time, the tree-ring records indicate, the eleven-year sun-spot cycle was shortened to ten.

Indications of the occurrence of sun-spot cycles have been found in tree-ring and other climatic records of prehistoric date at intervals for millions of years. These records have been studied in buried tree-stumps found in Southwestern canyons, in Ice Age trees excavated in Germany, in fossil redwoods in Yellowstone National Park that were green when three-toed horses roamed the earth, in the succession of thin clay layers of varves formed at the close of the Ice Age, and in certain Texas mineral deposits of Permian Age, before the dinosaurs came.

Besides the eleven-year "normal" sun-spot cycle, interrupted by occasional ten-year "dearth" cycles, sunspot maxima also show at least two other groupings, Dr. Douglass said. One of these is a period of a little over eight years, the other about fourteen years. These minor cycles often make the record hard to decipher, and it is only by mathematically "peeling them off" by means of what is called the cyclogram method, that the underlying main cycles become clearly distinguishable.

In his study of climatic cycles as recorded in treerings, Professor Douglass has examined and measured over a quarter of a million rings.

THE WEIGHT OF AN INSECT'S SKELETON

How much does an insect's skeleton weigh? This question has been accurately answered for the first time by Patrick Alfred Buxton, of the London School of Hygiene and Tropical Medicine.

Like many other investigators who make it their business to find out all they can about the lives of insects, he wanted to know as much as possible about their vital functions. He has been experimenting by exposing them to different conditions of dry and moist atmospheres, determining what sort of exposure does them the most harm. Yet many times, after he had noticed that insects lost both water- and dry-material weight after exposure, he found himself faced with the problem:

"How much of what remains of this insect is living matter on which it could perhaps call for energy, and how much of it is 'dead' skeleton?" He determined to find out.

Insects do not have large, bony skeletons like higher animals. Much of their "skeletons" are made up of chitin, the horn-like substance that forms their shells and stings and sheaths. Mr. Buxton could not simply dissect an insect, take out all its bones, and weigh them.

Selecting a bunch of fat meal-worms, he dried them out and removed all the fat with ether. The rest he put first into pepsin and then into pancreatin, which are two digestive juices. He had to powder the little dried bodies and break up the legs, and then coat them with a liquid that would make them sink in the juices. And so he let them digest—literally, just as they would be digested in the stomach of an animal—for three or four days. What was left, he weighed.

When he came to use blood-sucking insects, however, he found that his digestive juices would not dissolve haematin, the dried blood-substance. He had to work out another method. Back he went to his meal-worms and using the results obtained by digesting for comparison, he found that dissolving powdered dried insects in potassium hydroxide solution at the boiling point for 24 hours would give the same results. And potassium hydroxide will dissolve haematin along with the rest of it.

About one twelfth of the body of a meal-worm is skele-

ton, Mr. Buxton discovered, but that is not the important thing. Others now have, thanks to his work, a method by which they can find the skeletal proportion of any insect.

THE ANCESTRY OF MAN

MAN can not trace his physical ancestry to any existing or fossil genus of the great apes. He is too big to be their descendant. Man and such apes as gorilla and chimpanzee are alike giants among their zoological kindred, and giants do not beget giants of radically different kind.

This line of scientific argument, directly contrary to Darwin's original theory as to the descent of man, is advanced by Gerrit S. Miller, curator of mammals of the Smithsonian Institution, in a report to the American Society of Mammalogists through its official journal. Mr. Miller's discussion was evoked by an article by a distinguished British anthropologist, G. Elliot Smith, who traces modern man from the great apes of the tertiary geological period with such intermediate steps as the Java Man, *Pithecanthropus*, and the so-called Dawn Man of Piltdown, England, *Eoanthropus*.

Mr. Miller does not reject the idea of a derivation of man's physical ancestry from somewhere in the simian line. But, he points out, all analogies we have in other more complete lines of animal descent point to the derivation of larger creatures from smaller ones, not from other large animals.

"The fact that man and all the great apes, excluding the gibbon," he says, "are in the advanced evolutionary stage known as gigantism can hardly be doubted by anyone who will take the trouble to survey the living members of the order primates as a whole. For he will then see that this group of mammals is made up of hundreds of kinds whose size ranges from that of squirrels to that of bird dogs, a dozen or two that are somewhat larger, and four whose great bulk makes them wholly exceptional—gorilla, orang, chimpanzee and man. Obviously it is the majority and not one of the exceptions that must set the standard for size.

"The records of paleontology show that giants have arisen in many groups of mammals. More significantly, they show that these overgrown creatures commonly exist during short intervals, geologically speaking, and then become extinct without giving rise to new lines of development. Their racial life seems to have advanced beyond its period of plasticity. It is true that a gigantic stock dating from one age is often represented in a later age by a modified successor of its own general kind—as one elephant by another. But in no single recorded instance have we the fossils to demonstrate that an earlier mammalian giant has been modified into a later giant of an obviously different type—as a mastodon into a modern elephant or a great sabre-tooth into a modern great cat. So complete is the absence of evidence that a mere suggestion of such transitions would not be seriously put forward. Nevertheless the evolutionary anomaly implied by either of the two examples just mentioned is probably no greater than the one implied by the belief that a

great ape, its evolutionary trend stabilized in gigantism, could change, under stress of altering environment, into such an essentially different kind of giant as man.

"It might, perhaps, be urged that we should, in the absence of knowledge to the contrary, be prepared to admit that some such unusual thing may have happened on the human line of descent, as Darwin once guessed it had. But the proper reply to this argument would be to insist that the occurrence of no unusual event in zoological history can be demonstrated on the basis of an alluring surmise and a few bones about whose exact nature it has been impossible for students to agree."

WILD ANIMALS IN NATIONAL PARKS

THE wild animals of our national parks, which serve as game reservoirs to replenish the surrounding country, have every prospect of wintering in excellent condition, according to Dr. Harold C. Bryant, assistant director of the National Park Service in charge of research and educational activities.

Forage conditions in the parks in the Rocky Mountain region are much improved this year, as a result of last year's heavy snows, and in Yosemite and Sequoia National Parks, in California, grassy areas not previously seen resulted from the storms of a year ago.

Despite the severe weather of the 1931-32 winter, the park animals came through exceptionally well. Now, as a result of good grazing conditions throughout the summer, they are fat and in fine condition to stand the rigors of another season and to resist the inroads of disease.

A serious problem that has confronted the National Park Service for several years, according to Dr. Bryant, and one that has not yet been satisfactorily solved, is the great concentration of game animals at winter feeding grounds with resultant danger of over-grazing. The summer grazing grounds in the parks are sufficient to support much larger herds, with the exception of the Yellowstone buffalo herd, which is reduced each year to about 1,000 head. Winter feeding, however, still presents a problem, and many of the wild animals go outside the park boundaries in winter.

This situation has been especially acute in the Yellowstone, with the so-called hunters lying in wait in blinds outside park boundaries to snipe the animals, particularly the elk, as they drift across the line onto the flats beyond.

A decided step forward has been made this year in protecting Yellowstone Park animals by the issuance of an order by the Game Commission of Montana declaring a "closed season" of three days out of every week during the regular open season. This gives some of the animals a chance to cross the intervening flats and get beyond to the valleys where they may be stalked by true sportsmen.

Last year the Park Service was quite concerned over the reduction of the mountain or Dall sheep in Mount McKinley National Park, Alaska, as a result of the extremely severe winter. This year it is hoped that winter conditions there will be more favorable, so that the interesting sheep herds may have a chance to stage a good come-back.

ITEMS

INFRA-RED light added to the normal allowance of visible light caused tomato plants grown in the laboratory of plant physiology at the Smithsonian Institution to grow more or less like plants living in the shade. They grew long stems, with long internodes or joints, and their leaves were larger than those of "control" plants getting the same visible light but no infra-red. The relative water requirement of the "infra-red" plants was lower. The experiments were performed by Dr. Earl S. Johnston.

A HALF-MILE of gravel road near Baton Rouge, Louisiana, has been resurfaced with cotton cloth in tests which may yield a quick and economical method of modernizing America's millions of miles of dirt "farm-to-market" roads and make a new market for surplus cotton. Arnold M. Davis was the engineer in charge of construction. South Carolina, Texas and Georgia are also experimenting with cotton-surfaced roads and Louisiana and Oklahoma plan to install additional "test mileage." It is reported that a strip of "cotton road" laid in South Carolina six years ago and exposed to usual traffic conditions has required no repair attention and is still in excellent condition. Bound down with an asphaltic substance and given a top dressing of oiled gravel to meet the grind of the wheels, cotton increases the life of a road by making it thoroughly waterproof.

For a white male child born in the United States in 1930 the chances of dying of tuberculosis are 42.5 in 1,000. But for white boys born in 1925 the chances were 50.9 per 1,000 of dying of this disease, while those born in 1920 had 64.6 chances per 1,000 of eventual death from tuberculosis. "This means that, out of every thousand white males born at the present time, twentytwo escape the death of tuberculosis to which they would have been fated under conditions prevailing ten years ago, "according to statisticians of the Metropolitan Life Insurance Co., who computed the chances. White girl babies born in 1920 had 57.7 chances per 1,000 of dying of tuberculosis, while those born in 1930 had 35.6 chances per 1,000. Negro boys born in 1930 had 96.7 chances per 1,000 of dying of tuberculosis. Negro girls born in that year had 91.3 chances per 1,000 of death from this disease.

GIVE children toxoid to build up their resistance to diphtheria before vaccinating them against smallpox, is the advice suggested by studies of Dr. Charles Armstrong, of the U.S. Public Health Service. This should make the reaction to the smallpox vaccination comparatively mild and should avoid such complications as postvaccination encephalitis. Furthermore, diphtheria is now a greater hazard to children in the United States than smallpox, so it would seem logical to protect against it first. In recent years the diphtheria death-rate has been 70 times as high as the smallpox death-rate in this country. Dr. Armstrong's studies of post-vaccination encephalitis, a serious complication which has appeared in recent years, led him to advise that all first vaccinations should be done in infancy, in order to avoid the encephalitis.

CHARLES SCRIBNER'S SONS

NEW YORK . LONDON

& PRINCETON UNIVERSITY PRESS

Henry Fairfield Osborn

Biological Series (1894-1929) Scribners

I. FROM THE GREEKS TO DARWIN

New and completely revised edition of this standard historical work. 12mo. 3d thousand. Translations: Italian, Bulgarian.

II. IMPRESSIONS OF GREAT NATURALISTS

Sequel to Vol. I. Darwin, Wallace, Huxley, Balfour, Bryce, Pasteur, Leidy, Cope, Butler, Burroughs, Muir, Roosevelt. With portraits. 12mo. New and extended edition. 4th thousand. \$2.50

III. EVOLUTION AND RELIGION IN EDUCATION

Discussion with Bryan and other Fundamentalists of 1922-25. 12mo. 12th thousand. \$2.00

IV. CREATIVE EDUCATION

"I rejoice that you have put your ripe experience into this brilliant book. It is tonic."—WILLIAM McAndrew. With portraits. 12mo.

Life History of Earth and Man Series (1907-1928) Scribners

I. THE ORIGIN AND EVOLUTION OF LIFE

On the theory of action, reaction, and interaction of energy. Profusely illustrated. 8vo. 12th thou-

II. THE AGE OF MAMMALS

New and revised edition now in preparation. Profusely illustrated. 8vo. Translations: French, German, Spanish, Japanese.

IV. MEN OF THE OLD STONE AGE

Standard work in human archæology of the Palæolithic Age. Profusely illustrated. Thirteenth printing. Cr. 8vo. 24th thousand. \$5.00

Princeton University Press

V. MAN RISES TO PARNASSUS

Sequel to Vol. IV. Intellectual and spiritual evolution of man to close of New Stone Age. Illustrated. 8vo. 3d thousand. Translation: Rus-

VI. COPE, MASTER NATURALIST

Life and Letters of Edward Drinker Cope. Foundations of natural history and vertebrate palæontology in America. Complete bibliography, classified and annotated. Profusely illustrated. 8vo. \$5.00

Scribners

FIFTY-TWO YEARS OF RESEARCH, OBSERVATION AND PUBLICATION

Scientific biography; complete chronologic and classified bibliography, 1877-1931. Portraits. \$1.50

Supt. of Documents Government Printing Office, Washington

THE TITANOTHERES OF ANCIENT WYOMING, DAKOTA AND NEBRASKA

Monograph 55 of U. S. Geological Survey. Vols. I and II, 882 pp., 797 text illustrations, 236 plates. Thirty years in preparation, a complete research in Geology, Palæontology, and Biology. 300 copies remaining of original 1600. \$9.00

BOSTON UNIVERSITY SCHOOL OF MEDICINE

ORGANIZED IN 1873

ANNOUNCEMENT

may be obtained by application to

THE REGISTRAR

80 East Concord Street

Boston

Massachusetts

THE WISTAR INSTITUTE

SERVICE BIBLIOGRAPHIC

AUTHORS' ABSTRACTS

of all papers appearing in the journals listed below prior to publication of the articles in full. By this advance information biologists may familiarize themselves with contemporary research in a minimum of time.

Advance Abstract Sheets are issued twice a month, each sheet containing ten or more authors' abstracts. Subscription rate is \$3.00 per year.

Bibliographic Service Cards, following the Advance Abstract Sheets, also are issued twice a month. In addition to the authors' abstracts, the cards provide subject headings and complete bibliographic reference. The cards are convenient for filing and library records. Price, \$5.00 per year.

At regular intervals the authors' abstracts are assembled and published in book form with complete authors' and analytical subject indices. Price, \$5.00 per volume. Liberal discount to subscribers to the Bibliographic Ser-

vice Cards.

JOURNAL OF MORPHOLOGY
THE JOURNAL OF COMPARATIVE NEUROLOGY
THE AMERICAN JOURNAL OF ANATOMY
THE JOURNAL OF EXPERIMENTAL ZOÖLOGY
THE ANATOMICAL RECORD
AMERICAN ANATOMICAL MEMOIRS
AMERICAN JOURNAL OF PHYSICAL ANTHROPOLOGY
JOURNAL OF CELLULAR AND COMPARATIVE PHYSIOLOGY
FOLIA ANATOMICA JAPONICA (Tokyo, Japan)
PHYSIOLOGICAL ZOÖLOGY (Chicago, Illinois)
STAIN TECHNOLOGY (Geneva, New York)
ECOLOGICAL MONOGRAPHS (Durham, North Carolina)

The Wistar Institute of Anatomy and Biology Philadelphia, Pa., U. S. A.

SCIENCE NEWS

Science Service, Washington, D. C.

AN INTERNATIONAL RESEARCH INSTITU-TION PROPOSED FOR WORK IN CENTRAL ASIA

For permanent exploration and research in the vast and as yet but little known territory of Central Asia, comprising Mongolia, southern Siberia, Chinese and Russian Turkestan and Tibet, an international research institution should be established, with headquarters preferably in China. This suggestion was put forth at the annual dinner of the New York Academy of Sciences on December 17, by Roy Chapman Andrews, of the American Museum of Natural History, widely known for his successes in the Central Asian field.

The idea came to Mr. Andrews during the course of his work in Mongolia. Due to circumstances, he has temporarily abandoned it, he said, but he considered it worth recording in the hope that it might be put into effect at some future time.

Mr. Andrews concisely outlined the scheme for the proposed institution:

"What might be designated as an 'International Institution for Asiatic Research' would be established with its executive center in New York and its field headquarters in Peking. As a beginning it would have an endowment of a million gold dollars which I had intended to raise personally. As the work progressed, this endowment could be expected to be materially enlarged, giving an ever increasing income for field research.

"The scope of the institution would be international. In addition to a president, field director and other necessary officers, it would have an advisory council, represented by distinguished specialists in various branches of science. This body would decide upon the general plan of research; project the work to be undertaken each year; the specialists who would be invited to participate, and the ultimate disposition of their collections. These would be deposited in various world institutions where they could be most advantageously studied and be accessible to the greatest number of workers in that particular field. In return for such collections, an amount to be decided upon by the advisory council would be expected to be contributed to the endowment.

"The institution would not only finance each expedition but would arrange all details of governmental permits, transportation, servants, equipment, etc. When the particular scientists who had been invited to participate arrived at the point of departure, all preparations would have been completed. Without loss of time or energy they could go into the field and do their work.

"These expeditions, necessarily requiring assistants of various kinds, would furnish an excellent training school for young scientists and explorers, who now find great difficulty in entering the field of scientific exploration.

"Although the study of the collections would be undertaken at the institution where they were deposited, the scientific results would be published by the 'Asiatic Institution' for world distribution. . . . "Peking offers by far the most practicable place for the field headquarters of such an institution. It is at the gateway to Mongolia, and from China all the other regions of Central Asia can be reached with the least difficulty. As a first essential there must be the intelligent and active cooperation of the Chinese Government,"

In the course of his address, Dr. Andrews reassured his hearers that in spite of both Poles having been reached and most unknown corners of the earth at least traversed, there is no need for lamenting over lack of worlds to conquer. The outlet for the ambition of future explorers, he said, lies in the intensive investigation of areas as yet but partially known.

"We stand on the threshold of a new era of scientific exploration which is just as romantic, just as alluring and just as adventurous as that of Peary and Amundsen, of Stanley and Hedin," he said. "In most every country of the earth there lie vast regions which potentially are unknown. Some of them are mapped poorly if at all, and many hold undreamed of treasures in the realm of science. To study these little known areas, to reveal the history of their making and interpret that history to the world to-day; to learn what they can give in education, culture, and for human welfare—that is the exploration of the future!"

NEANDERTAL SKELETONS IN PALESTINE

DISCOVERY of a complete adult Neandertal skeleton in the Cave of the Oven, at the foot of Mount Carmel in Palestine, is reported by cable by Miss Dorothy Garrod, British archeologist, to Dr. George Grant MacCurdy, of Yale University. Dr. MacCurdy is director of the School of Prehistoric Research which is exploring for remains of ancient man jointly with the British School of Archeology.

The new discovery brings the number of Neandertalers found this year in Palestine up to a total of ten. Dr. MacCurdy points out that this is almost as many skeletons as the whole of Europe has yielded since the first discovery of the Neandertal type of man was made at Gibraltar in 1848.

The Mediterranean region is now revealed as a most important center in Neandertal times, Dr. MacCurdy states. This ungainly Neandertal type with its slouching gait, beetling brows, and massive bones, lived some 75,000 years ago, according to one estimate. The region which Dr. MacCurdy associates importantly with this early type of cave man ranges from Gibraltar on the west, southern France and Jugoslavia on the north, and Galilee and Mount Carmel on the east.

The newly found skeleton lay in the same cave which yielded the massive lower jaw of a man several weeks ago. Near the Cave of the Oven is the Cave of the Kids, where Dr. Theodore D. McCown found eight skeletons of Neandertalers last spring. In 1931, an additional skeleton was found, so that, altogether, anthropologists have eleven individuals of this remote Palestine cavedwelling age to study and compare.

fi

fı

MODEL SHOWING A TWIG'S GROWTH

VISITORS at the science exhibits of the Century of Progress Exposition in Chicago next year will have an opportunity to see in a minute and a quarter how the twig of a tree puts on a year's growth. A huge model, seven and a quarter feet in diameter, is now being constructed to represent a cross-section enlargement of a basswood or linden twig a quarter of an inch through. It will be so arranged that when a motor drive is started it will increase its diameter an additional eighteen inches, adding wood on the inside of the growing zone and bark on its outside, in the most realistic manner.

Every microscopic detail of the three-year-old twig is represented. Each cell of the three annual rings of the wood, with its central pith and the radiating pith-rays is outlined. At the outside, between wood and bark, is the cambium or growth layer. It is here that the main action takes place when the motor is started. Outside the cambium is the complex structure usually lumped as "bark," but detailed here into phloem or food-conducting strands, parenchyma or rind and true bark. The choice of basswood as the twig to be represented is an especially happy one, because that is the species studied by practically every beginning botany student.

The "growth" of the model is accomplished by means of a series of sliding plates and moving canvasses, which bear the outlines of the new, expanding cells. Each sliding plate is driven by a special worm gear; coarsepitched gears for the outside "bark" growth, finerpitched for the inside wood growth. The canvas is wound on rollers, and its unwinding simulates the twig's growth in diameter. When the motor is started the fourth year's "growth" is completed in 75 seconds; then the twig is automatically returned to its three-year condition, ready for the next "show."

COD-LIVER OIL AS FOOD

STUDYING the population of the Vadsö district in the extreme north of Norway, Dr. J. Kloster found that these fisherfolk were apparently unharmed by the enormous amounts of fish and cod-liver oil which they consume regularly.

The question of whether large doses of cod-liver oil are harmful has been raised by certain recent Swedish laboratory investigations. These showed that young laboratory animals, given enormous doses of cod-liver oil, develop abnormally, their growth and gain of weight being seriously impaired.

Dr. Kloster's studies were undertaken to determine whether this observation was applicable to human beings. He has just reported his findings to a medical journal published in Stockholm.

The people of the Vadsö district cultivate no corn, and only a few potatoes. They eat fish two or three times a day, and in the busy fishing season it is customary for an adult to consume every day about half a quart of "mölje," a mixture of liver and liver fat.

When storms cut off the supply of fresh fish, salt or frozen fish is eaten, washed down with cod-liver or other fish liver oil. In some of the poorest homes, fish is fried in cod-liver oil; and during the six winter months, the average consumption of cod-liver oil per head per day is more than one ounce. Some adults drink up to two tumblers of cod-liver oil at a time.

Babies begin to take cod-liver oil when only four months old. Dr. Kloster was greatly struck by the good state of their nutrition, and by that of the young children of his district. Yet they were living under conditions commonly considered unhealthy; the housing accommodation was cramped, and there was comparatively little sunshine throughout the winter.

Among the adult population he sought evidence of chronic cod-liver oil poisoning, but could find none. The few cases of heart disease he examined seemed to be unconnected with cod-liver oil consumption. The experiences of his colleagues and predecessors in the district were in this respect equally negative.

LEPROSY CONDITIONS IN HAWAII

FACILITIES for the care and treatment of lepers in Hawaii, so far as plant and equipment are concerned, are entirely adequate for the present. However, there is a lack of efficient organizations for the apprehension of suspects and the surveillance of family contacts and released patients, measures essential for the protection of the public health. These are the chief findings of the board of medical officers convened by the Surgeon-General of the U. S. Public Health Service to investigate the leprosy situation in Hawaii. The report of the board has just been made to Congress.

The federal government should not undertake to take over the care and treatment of lepers in Hawaii until the Territory itself requests such aid, Surgeon-General Hugh S. Cumming recommended in his letter transmitting the report of the board. However, the research activities and epidemiological investigations now being carried on in Hawaii by the federal government in close cooperation with the Territorial authorities should be continued and if anything expanded.

As a result of the board's report, Dr. C. H. Binford, of the U. S. Public Health Service, has been ordered to join Drs. N. E. Wayson and J. R. Murdock in the leprosy investigations being carried on by the federal government in Hawaii.

The board also reported, at the request of Congress, estimates of the costs of constructing, equipping and maintaining a receiving hospital, and of purchasing the present Territorial receiving hospital at Kalihi.

The need for better control and surveillance was emphasized. The board found that there are more leprous persons unapprehended than under surveillance. Of many hundreds of family contacts only 195 are reported to have been examined thus far. The conditions under which many of these persons live and their bearing on the propagation of the disease are largely unknown. In the interest of the public health it is important that new cases be found as quickly as possible and brought in for treatment, before the disease can spread to still other persons.

Leprosy in Hawaii has steadily decreased in the past 40 years and has decreased 50 per cent. during the past two years. However, the rate is still high. If the same

D

Su

Ab

tio

hea

car

Pr

ble

Lik

Th

rate prevailed in continental United States, it would mean that 19,200 new cases would be admitted annually to leprosy hospitals, out of a population of 120,000,000 persons.

On June 30, 1932, there were 162 leprous persons under care and treatment at the Kalihi Receiving Station, 430 at Kalaupapa Settlement and 145 released patients in their homes. In addition, the number at large and unknown probably equals or doubles this number. It is these at large cases that constitute the public health problem so far as control of the disease is concerned.

HIGH FEVER DECEPTIONS

REPORTS of the abnormally high temperatures with which a young Mexican girl in Los Angeles has been worrying her doctors recall the epidemics of high fever deceptions that have occurred. The highest temperature authentically reported which the patient survived was 110.6 degrees Fahrenheit. This was reported by Dr. Harold M. F. Behneman, assistant in the University of California Medical School.

The temperature in this case was not only higher than other authentic cases recorded but even higher than temperatures reported in some cases which were later shown to be hoaxes or exaggerations. Authentic reports of these unusually high temperatures seldom appear in the literature of the medical profession. Many of them are gross exaggerations which cause comment at the time, but are forgotten without investigation by physicians.

An exception to this was the case of a young woman in Escanaba, Michigan, who used a hot water bottle to produce very high readings of her doctors' clinical thermometers. This case was investigated by two Chicago physicians, Dr. R. Woodyatt and Dr. Morris Fishbein, of the American Medical Association.

Dr. Behneman's patient, soon after the terrific period of fever, began to recover from the skin disease from which he was suffering, and Dr. Behneman believed that the excessive heat of the body aided in controlling the bacteria causing his ailment.

A Swedish scientist, Dr. Ulf von Euler, recently reported a connection between fever and the adrenal glands. He pointed out that symptoms of fever can be produced by injecting adrenalin into the blood and also that human and animal subjects with over-active adrenal glands are feverish, and that it is impossible to cause fever in an animal that has lost its adrenal glands.

ITEMS

NEARLY half a century before Hertz and Marconi made the beginnings of early wireless, Joseph Henry, pioneer American physicist at Princeton, transmitted radio impulses several hundred feet, without connecting wires. That was in 1840. This epochal experiment was repeated on December 17 over the blue network of the National Broadcasting Company during the Joseph Henry birthday tribute directed by Orestes H. Caldwell, editor of *Electronics*.

Rural sanitation work of the U. S. Public Health Service will be hardest hit of the various activities of that federal bureau, it appears from the Treasury-Post Office supply bill reported back to Congress from the House Appropriations Committee. Public health items in this bill are slashed \$227,589 below Budget Bureau estimates. Of this, \$92,045 was cut from estimates for rural sanitation work. Other cuts below the budget estimates were for salaries in the surgeon-general's office; pay and allowances of commissioned officers; medical, surgical and hospital services, and expenses of the venereal diseases division. Increases in the budget estimates were allowed for the National Institute of Health, where much of the federal health research is conducted, and for the quarantine service.

An archeological expedition from the Peabody Museum of Harvard University has started for Panama, where it will seek information regarding Indian tribes that inhabited the country in prehistoric times. In the hills of Panama, in the province of Cocle, are remains of settlements and burying grounds which tell of an unknown people, not yet fitted into the picture of aboriginal America. This unknown Indian culture was discovered some years ago by a Peabody Museum expedition. For several years, Peabody expeditions have been exploring and excavating, in the hope of finding significant clues that will show more clearly what relationship these Indians bore to the important Mayan Indians north of them in Yucatan, or to other tropical tribes. The expedition party consists of Dr. S. K. Lothrop, Mrs. Lothrop and Henry B. Roberts.

Bob-white quail keep physically fit when they are protected against over-shooting, Milton B. Trautman, of the Ohio Division of Conservation, reported at a recent meeting of the Wilson Ornithological Club held in Columbus. Measurements and weights of Ohio bob-white quail, which have had fifteen years of continuous protection, were compared with records made during the early part of the century, and also with records of bob-white taken in "unprotected" states where other conditions are similar to those in Ohio. Ohio's protected quail showed no signs of deterioration as compared with the two other sets of records of unprotected birds.

THE jolts received in driving over rough pavement can now be recorded automatically by a new type of "roughometer" described before the meeting of the Highway Research Board in a report prepared by Homer J. Dana, assistant director of the Engineering Experiment Station of the State College of Washington. The riding qualities of various types of surfaces have been compared in preliminary tests conducted by Mr. Dana to test this automatic device developed at the State College Very little difference was found beof Washington. tween cement and oil surfaces, but a great deal of difference between new and old pavements. The smoothest road included in the test was a stretch of new concrete; the roughest was old concrete. Eight miles of brick road was, however, a close second for roughness.

THE WISTAR INSTITUTE BIBLIOGRAPHIC SERVICE

AUTHORS' ABSTRACTS

of all papers appearing in the journals listed below prior to publication of the articles in full. By this advance information biologists may familiarize themselves with contemporary research in a minimum of

Advance Abstract Sheets are issued twice a month, each sheet containing ten or more authors' abstracts.

each sheet containing ten or more authors' abstracts. Subscription rate is \$3.00 per year.

Bibliographic Service Cards, following the Advance Abstract Sheets, also are issued twice a month. In addition to the authors' abstracts, the cards provide subject headings and complete bibliographic reference. The cards are convenient for filing and library records. Price, \$5.00 per year.

At regular intervals the authors' abstracts are assembled and published in book form with complete authors' and analytical subject indices. Price, \$5.00 per volume. Liberal discount to subscribers to the Bibliographic Ser-

vice Cards.

JOURNAL OF MORPHOLOGY
THE JOURNAL OF COMPARATIVE NEUROLOGY
THE AMERICAN JOURNAL OF ANATOMY
THE JOURNAL OF EXPERIMENTAL ZOÖLOGY
THE ANATOMICAL RECORD
AMERICAN ANATOMICAL MEMOIRS
AMERICAN JOURNAL OF PHYSICAL ANTHROPOLOGY
JOURNAL OF CELLULAR AND COMPARATIVE PHYSIOLOGY
FOLIA ANATOMICA JAPONICA (Tokyo, Japan)
PHYSIOLOGICAL ZOÖLOGY (Chicago, Illinois)
STAIN TECHNOLOGY (Geneva, New York)
ECOLOGICAL MONOGRAPHS (Durham, North Carolina)

The Wistar Institute of Anatomy and Biology

Philadelphia, Pa., U. S. A.

BROOKLYN BOTANIC GARDEN MEMOIRS

BROOKLYN BOTANIC GARDEN MEMOIRS

Volume I: 33 contributions by various authors on genetics, pathology, mycology, physiology, ecology, plant geography, and systematic botany. Price, \$3.50 plus postage.

Volume II: The vegetation of Long Island. Part I. The vegetation of Montauk, etc. By Norman Taylor. Pub. 1923. 108 pp. Price, \$1.00.

Volume III: The vegetation of Mt. Desert Island, Maine, and its environment. By Barrington Moore and Norman Taylor. 151 pp., 27 text-figs., vegetation map in colors. June 10, 1927. Price, \$1.60.

AMERICAN JOURNAL OF BOTANY Devoted to All Branches of Botanical Science

Established 1914. Monthly, except August and September. Official Publication of the Botanical Society of America. Subscription, \$7 a year for complete volumes (Jan. to Dec.). Parts of volumes at the single number rate. Volumes 1-19 complete, as available, \$154. Single numbers, \$1.00 each, post free. Prices of odd volumes on request. Foreign postage: 40 cents.

All Forms of Life in Relation to Environment

Established 1920. Quarterly. Official Publication of the Ecological Society of America. Subscription, \$4 a year for complete volumes (Jan. to Dec.). Parts of volumes at the single number rate. Back volumes, as available, \$5 each. Single numbers, \$1.25 post free. Foreign postage: 20 cents.

GENETICS

A Periodical Record of Investigations bearing on Heredity and Variation

Established 1916. Bi-monthly. Subscription, \$6 a year for complete volumes (Jan. to Dec.). Parts of volumes at the single number rate. Single numbers, \$1.25 post free. Back volumes, as available, \$7.00 each. Foreign postage: 50 cents.

Orders should be placed with

The Secretary, Brooklyn Botanic Garden

1000 Washington Ave.,

Brooklyn, N. Y., U. S. A.

BOSTON UNIVERSITY SCHOOL OF MEDICINE

ORGANIZED IN 1873

ANNOUNCEMENT

may be obtained by application to

THE REGISTRAR

80 East Concord Street

Boston

Massachusetts

Just Published

Flora of the Prairies and Plains of Central North America

By PER AXEL RYDBERG, PH.D.

This cloth-bound volume contains 969 pages, with 601 text-figures. It includes descriptions of 177 families, 1066 genera, and 3,988 species, keys to all groups, with glossary, list of author abbreviations and index. It aims to describe all of the native and naturalized species of ferns, fern-allies and seed-plants of Kansas, Nebraska, Iowa, Minnesota, South Dakota, and of parts of Illinois, Wisconsin, Missouri, Oklahoma, Colorado, Wyoming, Montana, Manitoba, and Saskatchewan.

Price \$5.50, postpaid

Address The New York Botanical Garden Bronx Park (Fordham Station) New York, N. Y.

SCIENCE NEWS

Science Service, Washington, D. C.

MEDICAL HEROES

(Copyright, 1932, by Science Service)

WHILE the year 1932 was making another record of continued good health in spite of depression, a group of heroic men and women dared illness and death in the constant fight against disease. Many of these daring ones have escaped the enemy, disease, but a few have suffered illness and at least one died.

Dr. William Brebner, twenty-nine years old, assistant professor of bacteriology at New York University and Bellevue Medical School, lost his life in the battle against infantile paralysis. In the course of his research on this disease at the City Health Department Laboratories of New York City, he was badly bitten by a healthy monkey. The wound became infected and after about ten days, Dr. Brebner was paralyzed below the waist. Later the paralysis ascended till it reached his lungs and his breathing failed. Fellow investigators at the health department have not yet been able to determine the type of the germ that caused the fatal infection. It was not infantile paralysis or hydrophobia, they are certain.

Special guardians of the nation's health are the disease-fighters of the U.S. National Institute of Health in Washington. They work defiantly with ticks and fleas that carry deadly disease, and with the disease germs as well.

Within the last year three of them have suffered from typhus fever, and others are still risking an attack as they continue their studies. But they have found that in the United States this disease is carried by fleas from typhus-infected rats to healthy persons. And they are on the track of a protective vaccine.

First to suffer with the disease was Dr. Elmer T. Ceder, who was in the hospital just one year ago. Next was Dr. R. E. Dyer, chief of the typhus research team, who had barely recovered in December of this year when Dr. William G. Workman became ill. Now Dr. Workman is about well again, and others on the team, Drs. L. F. Badger and A. S. Rumreich, are wondering if it is about their turn.

Dr. Rumreich has been out in the field, seeking typhus patients and looking for rats and fleas. When Dr. Dyer was ill, he directed his assistants to feed some of his blood to body lice, in order to determine whether this insect can carry the American form of the disease, as it does the European. Drs. Rumreich and Badger searched every flophouse in Washington and Baltimore, but could not find any lice for their experiments, as this was not the season for lice, which do not appear until colder weather than prevailed in Washington in October.

One of the most dangerous disease-fighting jobs of the year, and one which will continue into the next year, is being tackled by Dr. H. E. Hasseltine in California. Dr. Hasseltine, also of the staff of the U. S. Public Health Service, is setting up his laboratory for investigation of parrot fever or psittacosis, which has been found to exist in breeding aviaries of Southern California. This is thought to be the source of the attack of parrot fever suffered this year by Mrs. William E. Borah, wife of the Idaho Senator.

Parrot fever research caused the death of one and the illness of eleven members of the staff at the U.S. National Institute of Health in 1930, when the first big outbreak of it occurred in the country. Dr. Hasseltine himself was one of the first to suffer an attack. His share in renewing the investigations of it is nevertheless daring, because it is not known whether or not one attack of the disease gives immunity or protection against further attacks.

Associated with him in California is Dr. V. M. Hoge, another federal disease-fighter. Dr. Hoge has never had parrot fever, but he knows that almost every one who had anything to do with the former research, and many who had nothing to do with it but merely worked in the same building, suffered from it. He and Dr. Hasseltine both know that one out of every five who get the disease dies of it.

From New York comes the report of another medical hero of 1932. B. R. Rickards, director of state public health education, deliberately risked carbon monoxide poisoning to gain firsthand knowledge of this peril, that he might be better able to teach the people of his state how to avoid it. Mr. Rickards closed the doors of his three-car garage and started the motor of his automobile. In just a minute, he reported, he felt a metallic taste in his mouth, got dizzy and drowsy. He rushed to the door just as his son, stationed outside to watch the proceeding, flung it open.

Finally, this healthy year of 1932 saw the death of that great disease-fighter, Sir Ronald Ross. His discoveries about malaria at the close of the last century have led to the effective prevention in nearly all parts of the world of that disease which once made a very black mark on the health records of any country in any year.

THE CANCER-PRODUCING CONSTITUENT OF COAL TAR

(Copyright, 1932, by Science Service)

THE exact chemical nature of the substance in coal tar which produces cancer has been discovered. The substance itself has been produced synthetically in the laboratory. This important success, following many years of failure, was recently reported in *Nature*, by Dr. J. W. Cook, I. Hieger and Hewett, of the Cancer Hospital Research Institute, London.

One type of cancer, which often afflicts chimney sweeps and workers in the coal tar industries, is due to irritation with coal tar. The same type of cancer occurs in mice that have had coal tar painted on the skin. Now the British investigators have found that the cancer-pro-

Of interest to all psychologists

STUDIES IN EXPRESSIVE MOVEMENT

GORDON W. ALLIPORT
Assistant Professor of Psychology
Harvard University

PHILIP E. VERNON Fellow of St. John's College, Cambridge University

With a Chapter on

"Matching Sketches of Personality with Handwriting" by EDWIN POWERS, Assistant Professor of Psychology, Dartmouth College

Is there such a thing as intraindividual consistency in expressive movement?

Is personality composed of unrelated habits or is it integrated? Can handwriting be taken as a deserving subject for psychological research? How can it profitably be studied?

How can other expressive movements be measured, rated, analysed?

Read this clear and reasonable account of original investigations in a rewarding field.

Its whole approach is novel, its implications arresting.

THIS volume presents a pioneer study of the patterns of gesture, or, more technically expressed, a study of the intra-individual consistency in expressive movement. Can all the distinctive body movements of an individual be correlated? Can the same story be read in the way he walks; estimates weights, sizes, distances; draws; and writes? A number of unusual experiments conducted by the authors throw light on this problem. With their highly significant conclusions they are reported in the first part of this book.

The second part of the volume investigates the specific problem of handwriting and personality, approaching a familiar idea in a new way. It makes two valuable contributions. In the first place it gives a critical summary, which is much needed, of the status of experimental graphology today. In the second place it presents several original experiments in which the services of a score of professional graphologists were secured, which by rigidly controlled methods study the agreement between psychological and graphological diagnoses or analyses of personality. A final chapter draws the two parts of the book together.

To be published in January

THE MACMILLAN COMPANY 60 Fifth Ave. New York City

ducing constituent of the coal tar is a previously unknown compound of hydrogen and carbon, 1.2 benzpyrene.

Samples of this compound which they made in the laboratory were as effective as material isolated from pitch in producing cancer of the skin in mice. The rapidity with which this synthetic compound caused skin cancer in mice indicated that it is the most active cancer-producing hydrocarbon known. Ordinarily it takes some time for the coal-tar cancers to be produced.

The cancer-producing benzpyrene was isolated by concentrating active fractions of coal tar pitch using a method of fluorescence spectroscopy developed by Mr. Hieger and W. V. Mayneord. The synthetic material was produced from pyrene, a complex hydrocarbon isolated from coal tar, but not to be confused with the popular fire extinguisher which has the trade-name of pyrene and is carbon tetrachloride.

While the identification and synthetic production of this substance responsible for one type of cancer has no immediate bearing on discovery of a cure for the disease, it should be a great aid to cancer research.

In the course of their study, the investigators also isolated from coal tar pitch three other hitherto unrecognized coal-tar constituents and identified one of them by synthesis. These are two hydrocarbons composed entirely of benzene rings, namely perylene and 4.5 benzpyrene, and one other compound, 1.2 benzanthracene from the chrysene fraction of coal tar. The 4.5 benzpyrene, which is closely related to the cancer-producing substance, was the one synthesized.

A HYGIENIC BUTCHER'S SHOP

A BUTCHER's shop, clean and germ-free like a hospital operating room, has been opened in Paris with the public blessings of several professors of the faculty of medicine and of representatives of the local authorities.

Dr. Kaplan, the author of this new venture in practical hygiene, has installed his salesmen in a huge glass chamber, the air of which is constantly being renewed and filtered, and kept at a temperature of 7 degrees Centigrade (45 degrees Fahrenheit). The salesmen wear rubber gloves and are dressed in white from top to toe. They cut up, weigh and pack the meat under the eyes of their customers with whom they communicate by means of microphones and loud speakers.

In the basement the meat is kept in refrigerators or in cold storage during the 48 hours which intervene between the arrival of the meat and its sale. Many other eatables besides meat are sold, and Dr. Kaplan has developed remarkable ingenuity in shepherding food from its source to the customer's hands through the necessary channels with the minimum of contamination and exposure.

Not only are Parisians being served with much cleaner food than heretofore, but they are absorbing practical lessons in hygiene which it is to be hoped they will apply on returning from this shop, the first of its kind in France, to their homes.

On the whole, the reaction of the Parisians has been favorable. But one captious critic has protested against

the white raiment and rubber gloves of the salesmen. They reminded him painfully of a surgeon in an operating theater. Butcher's shops, he felt, existed to provide palatable meat, not visions of appendicitis or peritonitis. This squeamishness does not, however, seem to have overtaken many of the shop's customers, for it is thronged by housewives willing to pick up not only bargains in meat, but also tips in hygiene.

The shop bristles with such tips. The housewife who for years has been accustomed to finger and smell meat before she buys it must feel baulked of these exercises of her tactile and olfactory faculties, but she will doubtless console herself with the reflection that smells in such a Pasteur-inspired atmosphere as that of this modern butcher's shop are an anachronism.

ITEMS

THE discovery, on December 17, of a comet that may prove to be Tempel's comet of 1866, known to be associated with the famous Leonid meteors of November, is reported by Dr. G. F. Dodwell, director of the Adelaide, Australia, Observatory. The close approach of Tempel's comet had been predicted, and for the past two months astronomers the world over had been searching for it. The theory is that the Leonids are the débris of a part of the comet or one traveling in a similar orbit The comet observed from Adelaide is around the sun. in the southern skies and it is visible only through powerful telescopes. Appearing as a diffuse object on photographic plates, it was located on December 21 by Professor George Van Biesbroeck, of the Yerkes Observatory.

WARNING against a holiday outbreak of trichinosis has been issued by the U.S. Department of Agriculture. The disease, which is often fatal, is caused by a parasite and is contracted by eating untreated raw pork or improperly cooked pork. Cases are especially common during the holiday season and winter in general, when sausage and various other pork products are eaten without proper cooking. There are approved methods of treating certain pork products that are customarily eaten without cooking which make them safe to eat in the uncooked state. These methods, however, are not practical outside commercial establishments and the treatment should be under official supervision, as provided in Federal meat inspection. No case of the disease occurring during fifteen years of observation has been traced to pork products prepared in establishments operating under the Federal meat-inspection service.

GOVERNMENT officials have notices of an invasion of locusts from over the border in Chiapas which have destroyed crops in the Papanotepec and Petapa region of southern Oaxaca, Mexico. Devastating floods in Chiapas during the past month were followed by great swarms of locusts flying in from Guatemala, invading the region of Tonalá and extending to the shores of the Pacific. Local forces of southern Oaxaca are being organized by the Bureau of Agricultural Defense of the Mexican Ministry of Agriculture to take the possible steps in combatting the insect plague.

PERIODICAL ROOM BENERAL LIBRARY UNIV. OF MICH.

SCIENCE

NEW SERIES Vol. 76, No. 1983

FRIDAY, DECEMBER 30, 1932

SUBSCRIPTION, \$6.00 SINGLE COPIES, \$.15

HAPPY NEW YEAR DO you know what these words mean? Can you find them—any of them!—in the Dictionary you are using? Turn to it and see. Not there! And yet they are words current in scientific circles and literature. There are hundreds—literally hundreds—of such words, of which these are just a few, defined only in the

NEW (16th) EDITION

American Illustrated Dictionary

adenomere
adrenalism
aglycemia
ajinomoto
albuminemia
allergosis
alveolysis
amniotin
andriatrics
anhormonia
apulmonism
atylosis
autarcesis
autopunition
avitaminotic

bacteriopexia barospirator beamtherapy bicarbonatemia blastotoxy Brouha test brucelliasis

calcipenia cancerology carotodynia chloropenia chromoma cocto-immunogen cresomania cryophilic cryptectomy cytocentrum

defundation dermagen desmosome dictyokinesis dysgonesis dysstasia

epidermicula eredosome exterofective

febriphobia fecaloma fibrinopenia filaricidal

gliosome granulopenia guanidinemia gynopathie

halophile hemangiectasis hemocrinia hemovolumetry heredo-immunity histoneurology homolysis hyalomere hypocalcia hypophysitis

insulinemia interofective iopax

kakergasia kaliemia kinetocyte

lacarnol larithmics leiasthenia liparthritis lipoiduria luteinization

mallophene mesophragma microgliacyte mucoclasis myxoglobulosis

neoteny nephrasthenia nyctohemeral

odontolysis

oleotherapy oligoglia olisthy oncogenesis ovalocytosis

panimmunity pantocain perirhizoclasia phosphopenia plasmophore pleiotropia potassemia predentin progestin prolan

rachiopathy ramicotomy relaxin reticulone

saceharochoria schwannoma semantic sialography sideroderma spermiocyte spirogram spodography staff cell stercoroma sucrosemia sympathin syntholia

tenofibril thermoduric thiemia thrombometer trichonodosis tubatorsion typology

urinophil urogram urotherapy

vacuome vaginography vasodepressor venofibrosis vulvopathy

wagnerism witkop

xanthemia xanthophore

zoning zookinase

The brand new (16th) edition was issued after the heaviest revision it has ever had—a revision by an editorial committee of the American Medical Association under the direction of Dr. Morris Fishbein. The terminology adopted conforms to the accepted standards of scientific bodies. A noteworthy new feature is the gallery of 279 portraits.

Octavo of 1493 pages, with 941 illustrations, 105 in colors. Edited by W. A. NEWMAN DORLAND, M.D.

......SIGN AND MAIL THIS ORDER FORM TODAY......

W. B. SAUNDERS COMPANY, W. Washington Square, Philadelphia

Please send the Dictionary as checked ($\sqrt{\ }$) and charge amount to my account:

American Illustrated Medical Dictionary.

plain, \$7.00 net;
indexed, \$7.50 net;
flexible binding;
stiff binding.



ANALYTICAL

BALANCE

This Balance was primarily designed for the educational laboratory in quantitative analysis where it has met with entire approval. It is, however, equally applicable to weighings in any laboratory because of its rugged construction, guaranteed accuracy and sensitivity, and long life.

Bearings and knife edges are of first quality agate. Capacity 100 grams, sensitivity 1/20 mg. The beam is $6\frac{1}{2}$ " long, sawed from a special hard rolled aluminum alloy with graduation in white on black with 50 divisions on each side of center, each division equivalent to $\frac{1}{10}$ mg. Rider carrier of new improved type. Release mechanism of fall-away type with three-point suspension for beam. When Balance is at rest, all knife edges are free from the bearings. Independent pan arrest, self-locking type. Pans of aluminum, $2\frac{5}{8}$ " diameter. Bows nickel silver $4\frac{1}{8}$ " wide by 8" high. Case of polished mahogany with slate sub-base. Balance measures $16\frac{1}{4}$ " long, $9\frac{1}{4}$ " wide, 15" high.

1810—Analytical Balance. As described above \$75.00

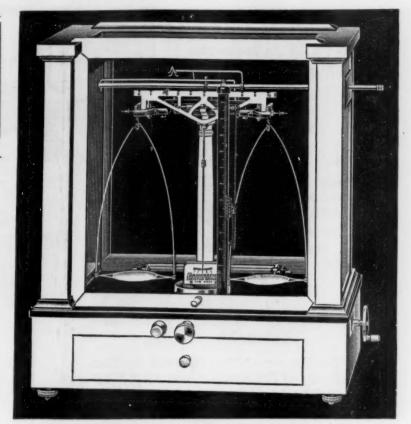
WILL CORPORATION

CHEMICAL, BIOLOGICAL, METALLURGICAL AND CLINICAL LABORATORIES

ROCHESTER, N.Y.

Dill Stand Up Under Difficult Working Conditions for an Unusually Long Time

Releasing Mechanism. The supporting points of the arrest arms move through the same arc as the supporting points of the beam, so that contact between edge and bearing always remains the same; this precludes the shifting of the beam with the consequent dulling of the agate edges rubbing over their respective bearings.



No. 8-A "CHAINOMATIC"
WITH GRADUATED NOTCHED BEAM

Analytical CHAINOMATIC Balance No. 8-A

with graduated notched beam

No weights from 1/10 mg. to 1.1 gram are required

The greatest development in balance construction. Simple in operation—Rapid—Accurate.

The rider or beam weight is rapidly and easily moved from one notch to another by means of a patented rider carrier operated from outside of case.

The "Chainomatic" attachment reads from 1/10 mg. to 100 mg.

No Weights Below 1 Gram Are Required.

Price (Code Word ANIGRA) - - \$210.00

Price with Movable Index

(Code Word ANIGRADEX) - - \$220.00

BETRISTIATR

SALES OFFICES

92 Reade Street, New York City 228 N. La Salle Street, Chicago 576 Mission Street, San Francisco

Factory: 147-153 Eighth St., Jersey City, N. J. Pacific Coast Distributors

> BRAUN-KNECHT-HEIMANN-CO., San Francisco

> > BRAUN CORPORATION, Los Angeles.

Movable Index or "Auto-Dex"

(Patented)

In the final adjustment of the equilibrium of an analytical balance—use the movable index ("Auto-Dex").

The movable index ("Auto-Dex") is controlled by a thumb wheel situated at the front of the balance case. A slight turn of the thumb wheel moves the index plate to the left or right as required until the indicator or pointer is coincident with zero of the index plate.

It is more rapid. It is more accurate.

It helps to preserve the knife edges. It avoids handling the beam.

It is described by many chemists as "A Laboratory Necessity."

This is all accomplished by moving the index plate instead of the adjusting nut on the beam.

Send for Bulletins Nos. 372, 373, 374

"POSTLIP"

ENGLISH FILTER PAPERS

Manufactured in ANNUALLY INCREASING QUANTITIES for upwards of 50 years.

White and Grey Plain, Antique, Crinkled, and Embossed



All sizes in Squares. Circles, and Folded Filters Rolls made to order.

Pure Filterings for Laboratory Work and in quantities for all industrial purposes

See Report of TESTS made by The National Physical Laboratory, a copy of which will be sent on application, together with free samples if required.

EVANS, ADLARD & CO., Ltd. POSTLIP MILLS, WINCHCOMBE, CHELTENHAM, ENGLAND.







A CONSTANT TEMPERATURE UNIT TO FIT ANY VESSEL

This temperature regulating assembly is designed for accuracy of control and flexibility of use. The regulator and heater assembly attach instantly to the wall of any vessel by means of vacuum cups. The Relay and pilot light assembly may be hung on the wall out of the way. Operating current is taken from the 110 volt AC supply by a single cord and plug. No other connections are necessary

Accuracy of control: With stirrer, ± 0.1°F; without stirrer, ± 0.5°F.

Write for bulletin No. 1203.

American Instrument Company, Inc. Washington, D. C.

Astronomical Motion Pictures

In response to numerous requests, the McMath-Hulbert Observatory of the University of Michigan announces that it now has available standard 35 mm. films showing sunrise and sunset phenomena in lunar craters, the motion of Jupiter's satellites, an occultation of Delta Capricorni by the moon and the total solar eclipse of August 31, 1932. The films are titled, and can be furnished also in the 16 mm. size, if desired. Films showing other astronomical phenomena of motion or change are in preparation. Details and prices may be had on application to Mr. Robert R. McMath, 5936 Milford Avenue, Detroit, Michigan.

MARINE BIOLOGICAL LABORATORY



Zoology Specimens Botany Specimens and Mounts Protozoan and Drosophila Cultures Microscopic Slides Live Marine Aquaria

> Catalogues on request Supply Department

Woods Hole, Mass.

U. S. A.



POCKET PRISM \$37.50 Stereoscopic pocket 8 power, 10 oz., 150 yds. field. NATURE

While we make a specialty of small, light-weight, Galileo and Prism pocket binoculars from \$5 upward, we carry all makes and sizes in new and

used instruments; also microscopes. Satisfaction guaranteed or money refunded; send for price-list and discount to students and institutions.

Vest pocket Mirakel 7 power monoculars \$9.50; 25 power telescope \$15.50.

J. Alden Loring Box 8 OWEGO, N.Y.

STYLOGRAPH

is a wax sensitized paper for graphic recordings. It marks with any sharp point and does not rub off like smoked paper.

THE STYLOGRAPH CORPORATION Rochester, New York Scottsville Road



Field Equipment for Engineers, Explorers, Hunters, Travelers

Scientific Instruments, Packing Equipment, Skis, Firearms, Clothing, Fiala Pat. Sleeping Bags, Optical Instruments, Astronomic Telescopes, Range Finders, Binoculars. Paulin Altimeters. Write for Catalog "A" FIALA OUTFITS

47 Warren St., New York

CONSTANT TEMPERATURE DEVICES



Ovens: with differential thermostatic temperature controls and mechanical-convection heating system. Complete range of sizes, for temperatures up to 260°C.



Water Baths: for general use requiring accurate control at relatively low temperatures, up to 100°C. Standard types and special models.



Thermostats: super-sensitive for high-precision work. Accuracy within 0.002°C. Temperature range from below room to 50°C.



Humidity Cabinets: with combined vapor pressure, humidity, and temperature controls; for observation of effects under various atmospheric conditions. Low and high pressure types.



Oil Baths: for high range work up to 550°F, and for testing, curing and heat treating operations where the absence of air and its oxidizing effect is desired.

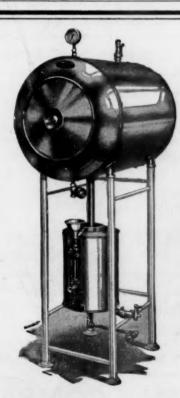
Dryers: with automatic temperature control and mechanical convection heating system; for any degree of heat up to 700°F, constant within 2°F.

We invite your inquiries, regarding any of the above or similar apparatus.

FREAS THERMO-ELECTRIC COMPANY 1207 So. GROVE St. IRVINGTON, N. J.

THE First Autoclave with the Eclipse Door. Originated in 1900 and developed to keep pace with the advances of laboratory technique.

Authorized dealers everywhere



BRAMHALL, DEANE Co.

Established 1859

51 East 21st Street

NEW YORK



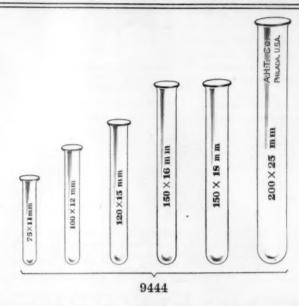
JAMES G. BIDDLE CO.

ELECTRICAL AND SCIENTIFIC INSTRUMENTS

1211-13 ARCH STREET. PHILADELPHIA. PA.

A. H. T. CO. SPECIFICATION

INDIVIDUALLY STRAIN-FINDER TESTED



TEST TUBES, A.H.T.Co. Specification. Undue breakage of test tubes is mostly because of insufficient annealing and uneven distribution of glass around the closed end.

These tubes are, therefore, individually passed through a polariscopic strainfinder—as they are selected and packed in our own establishment—to detect internal strain and all tubes showing pronounced color bands are rejected.

They are, furthermore, blown with a greater uniformity of distribution around the closed end than is possible in hand-blown tubes.

Our own experiments and the experience of large users indicate that breakage loss is much reduced by the use of these individually strain-finder tested tubes.

9444. Test Tubes, A.H.T.Co. Specification, thin wall, with lip, as above described. For chemical work. Packed in cartons of 100 each with exception of two largest sizes, i.e. 200 x 25 mm and 250×25 mm, which are packed in cartons of fifty each.

Length, mm	75	100	120	120	120	150	150
Outside diameter, mm	11	12	13	15	18	16	18
Per 100	1.25	1.40	1.85	1.85	2.25	2.10	2.35
20% discount in case of	1800	1800	1200	1200	1200	1200	1200
Code Word	Opmuf	Opnel	Opnns	Opnue	Opoas	Opodm	Opohe
Length, mm.		150	150	175	200	200	250
Outside diameter, mm		20	25	20	20	25	25
Per 100		2.35	4.00	4.75	5.15	5.15	8.70
20% discount in case of	***************	1200	800	800	800	400	400
Code Word		Opoky	Opoop	Oposh	Opovb	Opozt	Opphd

25% discount in lots of 10 cases, one size or assorted

For Test Tubes of Pyrex Glass and Culture Tubes, see pages 773 to 775, incl., of our new catalogue.

ARTHUR H. THOMAS COMPANY

RETAIL-WHOLESALE-EXPORT

LABORATORY APPARATUS AND REAGENTS

WEST WASHINGTON SQUARE
Cable Address, BALANCE, Philadelphia

PHILADELPHIA, U. S. A.

NEW BOOKS • McGRAW-HILL

RECENT SOCIAL TRENDS IN THE UNITED STATES

By the President's Research Committee on Social Trends

> With a Foreword by Herbert Hoover

Two volumes. $6\frac{1}{2} \times 9\frac{1}{2}$, xcv + 1568 pages

Price \$10.00 per set

The most comprehensive exploration of social changes ever undertaken. It is the result of an appointment by the President of the United States in September, 1929, looking toward such a review as might serve as a basis for the formulation of large national policies for the next phase in the nation's development. Nothing like this study had occurred before in American history.

This coöperative venture, representing the collective work of many eminent specialists, in both scientific research and practical experience, aims to provide a practical and effective work thoroughly grounded with a scientific base. It covers not only the changes since the beginning of the century, but also their background, for appraisal by all who deal with social questions.

It is a social inventory of the changing American social structure, presenting facts, not opinions, scientifically ascertained.

Wesley C. Mitchell, Professor of Economics, Columbia University, is Chairman of the President's Research Committee. William F. Ogburn, Professor of Sociology, University of Chicago, is Director of Research. Thirty-two specialists assisted by a large organization of scientific workers and coöperating bodies, collaborated on the work.

ELEMENTS OF OPTICS

By Joseph Valasek, Associate Professor of Physics, University of Minnesota. Second edition. 260 pages 5½ x 8, illustrated. \$2.25.

APPLIED X-RAYS

By George L. Clark, Professor of Chemistry, University of Illinois. *International Series in Physics*. Second edition. 470 pages, 6 x 9, illustrated. \$5.00.

ATOMIC ENERGY STATES

Compiled by Robert F. Bacher, National Research Fellow and Samuel Goudsmit, Professor of Physics, University of Michigan. *International Series in Physics*. 562 pages, 6 x 9, illustrated. \$6.00.

THE PRINCIPLES OF OPTICS

By Arthur C. Hardy, Associate Professor of Optics and Photography and Fred H. Perrin, Instructor in Physics, Massachusetts Institute of Technology. International Series in Physics. 632 pages, 6 x 9, illustrated. \$6.00.

PSYCHOLOGY

By Shepherd I. Franz, Professor of Psychology, and Kate Gordon, Assistant Professor of Psychology, University of California at Los Angeles. *McGraw-Hill Publications in Psychology*. 490 pages, $5\frac{1}{2} \times 8$, illustrated. \$2.50.

PRINCIPLES OF GENETICS

By Edmund W. Sinnott, Professor of Botany, Barnard College, Columbia University and L. C. Dunn, Professor of Zoölogy, Columbia University. McGraw-Hill Publications in the Agricultural and Botanical Sciences. Second edition. 441 pages, 6 x 9, illustrated. \$3.50.

GEOLOGY

By Professors W. H. Emmons, G. A. Thiel and C. R. Stauffer of the Department of Geology, University of Minnesota, and I. S. Allison, Department of Geology, Oregon State Agricultural College. 510 pages, 6 x 9, illustrated. \$4.00.

Send for copies on approval

McGRAW-HILL BOOK COMPANY, Inc.,

330 West 42nd Street, New York

Aldwych House, London, W. C. 2

En 165

For

Pri

xii

Sie

\$1.

Cla

Ku

\$11 Eic

Mes

Ell

ato

v. 3

der

Gro

sers.

Nal

He

u.

He

roic

Hu

ihre Ill.

Lai

En

\$2.4

Pet

d. 6

Sol

Sch

\$0.8

Tac

ueb

Dri

okk

\$1.3

He

xi+

He

i. d

bes

Rai

d. J

Fri

kun loge

pp.
Jae
Mas

Ker

san

RECENT SCIENTIFIC BOOKS

which by arrangement with The Science Press are offered by G. E. STECHERT & CO., 31 East 10th St., New York to which firm orders should be addressed

PHYSICS-MATHEMATICS

Eggert, J. & Schmidt, R. Einfuehrung i. d. Tonphotographie. Photograph. Grundlagen d. Lichtton-Aufzeichnungen. 122 ill. pp. vi+137. \$2.04.

Geiger, H. Quantenhafte Ausstrahlung. 209 ill. 373 pp. (Handbuch d. Physik, Ed. Geiger-Scheel, vol. 23: I.) \$8.33. 2 ed. (sold only with vol. 23^{II}).

Geiger, H. Negative und positive Strahlen. 345 ill. 364 pp. (Handbuch d. Physik, Ed. Geiger-Scheel, vol. 22: II.) \$8.33. 2 ed. (sold only with 221).

Geiger, H. Elektronen, Atome, Ionen. 163 ill. pp. vii + 492. (Handbuch d. Physik, Ed. Geiger-Scheel, vol 22: I.) \$10.73. 2 ed. (sold only with 22^{II}).

Hahn, Hans. Reelle Funktionen. Tl. 1: "Punktfunktionen." pp. xi + 415. \$7.68.

Jahrbuch fuer Photographie, Kinematographie und Reproduktions-verfahren. Ed. by Eder, Kuchinka Kustos & Emmermann. Vol. 31. (1928–1929.) Pt. 1. 70 ill. pp. viii + 320. \$4.75.

Mueller-Pouillet. Lehrbuch der Physik. Vol. IV. 1: "Valentiner, S. Grundlagen d. Lehre v. d. Elektrizitaet u. dem Magnetismus." 730 pp. Ill. \$12.24.

Photofreund Jahrbuch. Ed. by Willy Frerk. Jg. 9 (1933) 203 ill. 258 pp. \$1.63.

Schaefer, Clemens. Einfuehrung i. d. theoretische Physik. (3 vols.) Vol. III: 1 "Elektrodynamik u. Optik." 235 ill. pp. viii + 918. \$9.60.

Schiebold, Ernst. Die Lauemethode. Ill., pp. xx+173. (Methoden d. Kristallstrukturbestimmung mit Roentgenstrahlen I.) \$3.12.

Veblen, O. Projektive Relativitaetstheorie. Ill. (Ergebnisse der Mathematik II: 1.) \$2.10.

ASTRONOMY

Becker, Friedrich. Das Sternensystem. Pt. I. 173 ill. pp. x+574. (Handbuch d. Astrophysik, ed. Eberhard-Kohlschuetter-Ludendorff, vol. V. 1: 1.) \$23.76.

Hopfner, F. C. Physikalische Geodaesia. Ill. pp. xi+434. \$7.44.

Hunziker, Edwin. Das astronomische Nivellement im Meridian des St. Gotthard. Vol. I: "Die beobachteten Lotabweichungen." Ill. 160 pp. \$2.00.

Vegard, Lars. Results of investigations of the auroral spectrum during the years 1921-1926. 25 textill. 71 pp. \$1.80.

CHEMISTRY & CHEM. TECHNOLOGY

Bernhardt & Marcher. Streichgarnspinnerei sowie Herstellung von Kunstwolle u. Effiloche. 357 ill. pp. viii + 350. (Die Wollspinnerei A.) \$9.00.

Better & Davidsohn. Taschenbuch fuer die Wachs-Industrie. Ed. by Leudecke. 383 pp. \$3.00.

Edlbacher, Siegfried. Kurzgefasstes Lehrbuch der physiologischen Chemie. 2nd ed. pp. viii + 252. \$2.64.

Goldschmidt, St. Stereochemie. Ill. 311 pp. (Hand- u. Jahrbuch der Chemischen Physik.) \$6.96.

Gruetzner, Artur. Eisen- und Stahllegierungen. Patentsammlung, geordnet nach Legierungssystemen. 308 pp. \$7.68.

Jablonski, Ludwig. Handbuch der Leder-Industrie. Vol. I: "Lederfabriken u. Gerbereien, einschl. Haeute- u. Fellgrosshandel." 4th ed. 264 pp. \$3.60.

CHEMISTRY & CHEM. TECHNOLOGY—Continued

Jacob-Witte-Padelt. Mengenmessungen im Betriebe. 221 ill. pp. ix + 274. (Der Chemie Ingenieur II. 2.) \$6.62. Lehner, Sigmund. Die Kitte und Klebemittel. Ausfuehrl. Anleitung z. Darst. saemtl. Kitte u. Klebemittel f. alle Zwecke. 10th ed. pp. viii + 188. \$1.08.

Mann, H. Die moderne Parfumerie. Eine Anleitung u. Sammlung von Vorschriften z. Herstellung saemtl. Parfumerien u. Kosmetika unter bes. Beruecks. d. kuenstl. Riechstoffe einschl. d. Parfumierung d. Toiletteseifen. 4th ed. by Dr. F. Winter. pp. vii + 522. \$5.76.

Philippi, E. L. W. Elektrizitaet unserer Tage. III. 191 pp. (Electrizitaet i. ind. Betrieben.) \$4.18.

Pincass, Heinrich. Die industrielle Herstellung von Wasserstoff. Ill. 82 pp. \$1.75.

Prausnitz, Paul. Glas- und keramische Filter im Laboratorium fuer Filtration, Gasverteilung, Dialyse, Extraktion. 199 ill. pp. viii + 193. \$2.83.

Riesenfeld, E. H. Anorganisch-chemisches Praktikum. 111. 386 pp. \$1.83.

Rupe, Hans. Adolf von Bayer als Mensch und als Forscher. Erinnerung aus seinem Privatteben. 26 pp. (Slg. chemischtechnischer Vortraege.) \$0.63.

Salmony, Alfred. Ueber das Trockeneis. Ill. 61 pp. (Slg. chem. techn. Vortraege.) \$1.54.

Stutzer, O. & Wetzel, W. Phosphat-Nitrat. Ill. pp. xiv + 390. \$8.16.

Waeser, Bruno. Die Luftstickstoff-Industrie mit Beruecksichtigung d. chilenischen Industrie u. d. Kokereistickstoffs. 2nd ed. 145 ill. pp. viii + 509. \$7.92.

GEOLOGY & GEOGRAPHY

Egger, Carl. Die Eroberung des Kaukasus. 25 ill. 311 pp. \$2.40.

Faber, Kurt. Tage und Naschte in Urwald und Sierra. Peru, Bolivien, Brasilien. 6th ed. 310 pp. \$1.58.

Geographisches Jahrbuch. Begr. 1866 durch E. Behm. Fortges. durch H. Wagner. Ed. by L. Mecking. Vol. 47. 1932. Pp. xii + 374. \$13.50.

Hausenstein, Wilhelm. Europaeische Hauptstaedte. 421 pp. \$2.04.

Hinzpeter, Georg. Die Bildung der Hochgebirge durch Kosmische Katastrophen. Ill. pp. vi + 295. \$1.62.

Kober, L. Das Weltbild der Erdgeschichte. 17 ill. pp. viii + 160. \$1.92.

Lehmann, Otto. Die Hydrographie des Karstes. Auf einfach entwickelter, physik. u. hydraul. Grundlage bearb. Ill. pp. xv + 212. \$5.38.

Meyers Hand-Atlas. 217 Haupt- u. Nebenkt. Mit alph. Namenverz. by Lehmann. 9th ed. 281 pp. 165 charts. \$4.50.

Meyers Grosser Hand-Atlas. Ed. by Prof. Creutzburg. 360 Haupt- u. Nebenkarten. Nebst alphabet. Namenverz. 231 charts. 249 pp. \$7.20.

v. Philipsborn, H. Tabellen zur Berechnung von Mineralund Gesteinsanalysen. pp. xii + 312. \$6.72.

Tams, Ernst. Grundzuege der physikalischen Verhaeltnisse d. festen Erde, ihre Beziehungen z. geolog. Gestaltung d. Erdantlitzes, Pt. I: "Grosse, Gestalt u. Konstitution d. Erde, ihre therm. u. grav. Verhaltnisse." Ill. pp. viii + 184. \$3.36.

Vatter, Ernst. Ata Kiwan. Unbekannte Bergvoelker im trop. Holland. Ein Reisebericht. Various charts & plates. 164 ill. 294 pp. \$4.32.

RECENT SCIENTIFIC BOOKS (Continued)

BOTANY

Engler, A. & Diels, L. Das Pflanzenreich. Heft 98d. IV. 165. Sapindaceae IV. 160 pp. Ill. \$5.43.

Fortschritte der Botanik, Ed. by Fritz v. Wettstein. Vol. I: "Bericht ueber das Jahr 1931." Ill. \$4.46.

Pringsheim, Ernst. Julius Sachs der Begruender d. neueren Pflanzenphysiologie 1832-1897. 13 plates. pp. xii + 302. \$4.32.

Sieberg, A. Untersuchungen ueber Erdbeben und Bruchschollenbau im oestlichen Mittelmeergebiet. Ill. 111 pp. \$1.68.

BIOLOGY & ZOOLOGY

Claus, Carl. Lehrbuch der Zoologie. New ed. by Grobben Kuehn. 10th ed. by Claus. 1164 ill. pp. xi+1123.

Eickstedt, E. v. Rassenkunde und Rassengeschichte der Menschheit. Lfg. 1. Ill. 144 pp. \$2.40.

Ellenberger & Baum. Handbuch der vergleichenden Anatomie der Haustiere. 1393 ill. pp. xvii + 1102. (17th ed. of ''Anatomy d. Haustiere.'') \$21.36.

v. Frisch-Goldschmidt-Ruhland-Winterstein. Ergebnisse der Biologie. Vol. IX. 100 ill. \$11.52.

Groebbels, Franz. Der Vogel, Bau, Funktion, Lebenserscheinung, Einpassung. Vol. 1: "Atmungswelt u. Nahrungswelt." 234 ill. pp. xii + 918. \$17.28.

Heinrich, Gerd. Der Vogel Schnarch. 2 Jahre Rallenfang u. Urwaldforschung in Celebes. 63 ill. 198 pp. \$1.15. Hertwig, Richard. Ueber den Bau der Peripyleen (Sphae-

roideen). 5 plates. 40 pp. \$1.92. Huene, Friedrich. Die fossile Reptil-Ordnung Saurischia,

Huene, Friedrich. Die fossile Reptil-Ordnung Saurischia, ihre Entwicklung u. Geschichte. Parts 1 & 2. 56 plates. Ill. pp. vi + 361. \$57.60.

Lange, D. & Nierstraz, H. F. Tabellarische Uebersicht der Entwicklung von Tupaia javanica Horsf. Ill. 87 pp. \$2.45.

Peus, Fritz. Die Tierwelt der Moore unter bes, Beruecks. d. europ. Hochmoore. 35 ill. pp. viii + 277. \$5.94.

Sokolowsky, Alexander. Erlebnisse mit wilden Tieren. Schilderungen aus meinen Berufsleben. 2nd ed. 253 pp.

Taenzer, Ernst. Das Angorakaninchen. Nebst ei. Beitrag ueber die Krankheiten d. Angorakaninchens v. Sprehn. 53 ill. 161 pp. \$1.68.

PSYCHOLOGY

Driesch, Hans. Parapsychologie, die Wissenschaft von den okkulten Erscheinungen. Methodik u. Theorie. 149 pp. \$1.32.

Henning, Hans. Psychologie der Gegenwart. 2nd ed. pp. xi+211. \$0.72.

Heyer, Gustav R. Der Organismus der Seele. Eine Einf. i. d. analyt. Seelenheilkunde. Mit 37 Bildern a. d. unbesussten Seelenleben. 151 pp. \$1.54.

Rank, Otto. Erziehung und Weltanschauung. Eine Kritik d. psychol. Erziehungs-Ideiologie. 183 pp. \$1.39.

ENGINEERING

Frick-Dausch. Taschenbuch fuer metallurgische Probierkunde, Bewertung und Verkaeufe von Erzen fuer Geologen, Berg-, Huetteningenieure u. Prospektoren. 51 ill. pp. xi+250. \$3.46.

Jaeger, Wilhelm. Die Entstehung der internationalen Masse der Elektrotechnik. Ill. pp. v+101. \$2.16.

Kempf-Foerster. Hydromechanische Probleme des Schiffsantriebs. 447 pp. Ill. \$4.56.

ENGINEERING—Continued

Kieslinger, Alois. Zerstoerungen an Steinbauten. Ihre Ursachen u. ihre Abwehr. 291 ill. pp. viii + 346. \$6.48.

Naebauer, Martin. Vermessungskunde. 2nd ed. 439 ill. pp. ix + 401. \$5.64.

Richter, Oswald. Neue Beitraege zur Photosynthese und Photolyse vornehmlich an der lebendigen Pflanze. 42 pp. \$2.23.

Schiller, L. & Eisner, F. Stroemungslehre der Rohre und offenen Gerinne auf experimenteller Grundlage. 323 ill. pp. vii + 480. \$9.36.

Skaupy, Franz. Die Grundlagen des Tonfilms. Ed. by Dr. Wolf. 84 ill. 123 pp. \$2.28.

MEDICINE

Best-Fromme-Payr-Rostoski-Saupe-Schmorl. Anleitung zur fruehzeitigen Erkennung der Krebskrankheiten. 134 pp. \$-.72.

Denker, A. & Albrecht, W. Lehrbuch der Krankheiten des Ohres und der Luftwege, einschliesslich der Mundkrankheiten. 12./13. Aufl. 650 pp. Ill. \$6.96.

Fabian, Heinrich. Merkmale und Grenzen in der Domestikationsfrage am Gebiss. Ill. 96 pp. \$1.92.

Gold, Ernst. Die Chirurgie der Wirbelsaeure. 239 ill. pp. viii + 364. \$10.92.

Guttmann, Walter. Medizinische Terminologie. Ableitung u. Erklaerung d. gebraeuchl. Fachausdruecke aller Zweige d. Medizin u. ihrer Hilfswissenschaften. 600 ill. by Marle. pp. vi + 1243. \$4.80.

Handbuch der Roentgen-Diagnostik und Therapie im Kindesalter. Ed. by Engel & Schall. 637 ill. pp. xii + 720. \$18.00.

Henseler, H. & Fritsch, E. Einfuehrung in die Diathermie. 3rd ed. Ill. 563 pp. \$2.11.

Henseler, Dr. Die Hochfrequensbehandlung mit Hochleistungs-Apparaten i. d. aerztlichen Praxis. 112 pp. \$-.72.

Herxheimer, K. & Hofmann, E. Die Hautkrankheiten. Leitfaden f. Studierende und Aerzte. 56 ill. 2nd ed. pp. viii + 274. \$3.17.

Hochrein, Max. Der Coronarkreislauf. Physiologie, Pathologie, Therapie. 54 ill. pp. vii + 227. \$5.76.

Jagic, Nikolaus. Perkussion und Auskultation. Leitfaden f. Studierende u. Aerzte. 21 ill. pp. viii + 111. \$1.20.

Kuester, Heinz. Gynaekologische und geburtshilfliche Diagnostik in Tabellenform. Ill. pp. viii + 7. 32 charts, 65 plates. \$2.74.

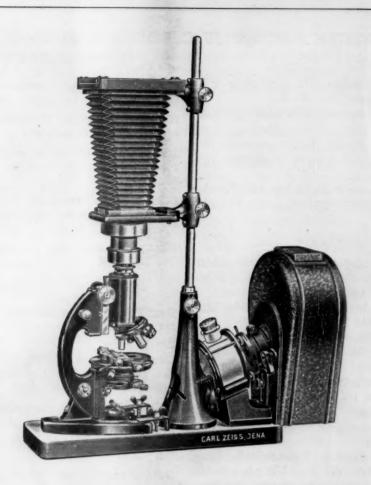
Much, Hans. Arzt und Mensch. Lebensbuch ei. Forschers u. Helfers. 267 pp. \$1.39.

Nager, F. & Meyer, M. Die Erkrankungen des Knochensystems u. ihre Erscheinungen an der Innenohrkapsel des Menschen. 65 ill. 231 pp. \$2.88.

Schilling, Victor. Blut and Traum. Praktische u. gutachtl. Anwendung d. Blutuntersuchungen a. d. Gebiete d. Unfall-, Gewerbe-, Versicherungs- u. Versorgungsmedizin. 16 ill. pp. vii + 196. \$2.40.

Woysche, Dr. Die Rotlicht Tiefen-Therapie. 56 pp. Ill. \$-.40.

Zangger, Heinrich. Die Gasschutzfrage. 132 pp. \$1.20.



ZEISS

PHOTO-MICROGRAPHIC CAMERA 31/4 x 41/4 INCH

The Camera is mounted on a heavy base which provides place for the microscope on one side and on the other side carries the illuminating apparatus. The latter includes an aspheric lens condenser with field of view iris diaphragm and a liquid filter cell. The source of light is a 400 Watt gas filled incandescent lamp, operating on a 110 volt circuit.

Price, complete with two double plate holders, resistance for dimming the lamp, simple focusing magnifier sleeve for connecting the microscope, but without microscope.

\$146.25 f. o. b. N. Y.

CARL ZEISS, INC.

485 Fifth Avenue

728 So. Hill Street

YOR



LOS ANGELES

